



FRIDAY, JULY 14, 1893.

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## Contributions.

## Compound Locomotives - Some Comparisons.

53 STATE ST., BOSTON, July 10, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the letter of S. M. P. in your issue of June 23, who quotes a note from the *Master Mechanic* as to performances of Old Colony compound and simple locomotives, it seems that it is best to refresh his memory.

I do not know how the *Master Mechanic* obtained its figures, as no weights of coal have been made since the tests, the results of which have already appeared in your columns. S. M. P. says that he believes that Old Colony locomotives evaporate five pounds of water per pound of coal. The facts are as follows for the conditions stated:

For 6-car passenger trains at 40 miles per hour, simple locomotive.....	6.12 lbs.
For 6-car passenger trains at 40 miles per hour, compound locomotive.....	7.51 lbs.
For 11-car passenger trains at 36 miles per hour, simple locomotive.....	6.33 lbs.
For 11-car passenger trains at 36 miles per hour, compound locomotive.....	6.92 lbs.
For 12-car passenger trains at 40 miles per hour, simple locomotive.....	5.46 lbs.
For 12-car passenger trains at 40 miles per hour, compound locomotive.....	6.11 lbs.
For 25-car freight trains at 26 miles per hour, simple locomotive .....	6.74 lbs.
For 25-car freight trains at 26 miles per hour, compound locomotive.....	7.98 lbs.

A similarly arranged table showing the number of pounds of coal used per mile is as follows:

For 6-car passenger trains at 40 miles per hour, simple locomotive.....	55.3 lbs.
For 6-car passenger trains at 40 miles per hour, compound locomotive.....	38.7 lbs.
For 11-car passenger trains at 36 miles per hour, simple locomotive.....	66.1 lbs.
For 11-car passenger trains at 36 miles per hour, compound locomotive.....	49.8 lbs.
For 12-car passenger trains at 40 miles per hour, simple locomotive.....	84.7 lbs.
For 12-car passenger trains at 40 miles per hour, compound locomotive.....	59.2 lbs.
For 25-car freight trains at 26 miles per hour, simple locomotive.....	63.0 lbs.
For 25-car freight trains at 26 miles per hour, compound locomotive.....	46.4 lbs.

These results are the averages from five to ten round trips, and include in each case the coal used in banking fires over one night. If the banking coal had been deducted the results would have been even better.

The results here given are obtained from actual and accurate coal weights, and must stand until other similar tests are made, but in comparing them with results from C. B. & Q. tests, S. M. P. must remember that the Old Colony locomotives have small, deep fireboxes, and that C. B. & Q. locomotives have large, shallow ones.

F. W. DEAN.

## Yard Limits.

TO THE EDITOR OF THE RAILROAD GAZETTE:

What does a yard limit board signify? I have always been under the impression that such boards were placed for a purpose, and that purpose, particularly at terminals and large transfer yards, to protect trains within their boundary against following trains, without the flagging indispensable elsewhere, except against first-class trains. Enginemen should pass them pulling into or through yards, with train under complete control, expecting to find a yard or other engine or train occupying the main track unprotected otherwise than by the *standing order* yard limit; they to be solely responsible for any accident that may occur in consequence of not

having the train under control. If my hypothesis is tenable, and I venture to assert it is, in the opinion of most, if not all, trainmen, why do we not get positive orders as to their meaning?

The fact that an unwritten rule is so universally construed, and relied upon for protection, is the most conclusive argument why it should be officially and unambiguously issued.

If a thousand persons fall into an error, the number can have no effect to make that error true. If, however, the erroneous interpretation of the rule insures greater safety than the literal, why not by a stroke of the pen make it an error no longer? It must be conceded that it is almost as difficult to make a man unlearn his errors as his knowledge. Ignorance is a blank sheet on which we may write; but error is a scribbled one, on which we must first erase.

I have before me the books of rules of three prominent railroads, and in neither of them are yard limits mentioned. The timetable, special rules touch on yard limits, but somewhat confusedly and very guardedly, much as a novice would handle a dynamite cartridge. They appear to be afraid of the thing, and yet their timid failure to handle the subject unequivocally and boldly results in just what they wish to avoid—destruction of property, suspensions, dismissals, personal injury and possibly loss of life—and leaves a loophole.

A trainmaster said to me recently, in reply to a question as to why the rule was not more specific: "Superintendents believe that two heads are better than one. By placing the responsibility on two, the engineman who runs incautiously will receive timely warning from the preceding flagman." That would be all right if the flagman so understood it, but he does not believe that he is expected to do any such thing, except, if he be a man of good judgment, as a matter of precaution. When the rear of his train is standing just around a curve, he flags, not because he believes he is obliged to, but simply as a favor to the other man—the approaching engineman. He reasons that yard limit boards are placed not only to give employment to carpenters and painters, but to give absolute protection to trains within their confines, and the average conductor coincides with his view. I have often heard conductors instruct their flagmen not to flag within yard limits, for the reason that they did not wish to establish a bad precedent, but I do not recall ever having seen a rule abrogating flagging within yard limits.

A note on a timetable before me reads: "All trains will approach and run through [designated] yards cautiously," and another as follows: "The following train (when running on a green or cautionary signal, without getting written clearance) will be held responsible for accident caused by overtaking the preceding train." If that does not imply no flagging, what does it mean? If that is the purport, why not say so without ambiguity? Division of responsibility and its resulting dangers have been treated so exhaustively in your articles on permissive blocking that it has been made very plain that everybody's business is nobody's business.

Please note the following clause of a special rule: "308. . . . All except first-class trains must, within yard limits, be run with great caution and under such complete control that they will not collide with yard engines." Also the following: "328. . . . All trains and engines, except first-class trains, in approaching from the west, must come to a full stop at yard limit board at extreme western end of yard, unless the track is plainly seen to be clear." Plain and positive enough, surely. Is there any occasion for a freight to protect itself against other freights when standing inside of that limit board? There was a train standing a matter of 10 car lengths or more east of that particular signal board one afternoon, and some cars were being dropped from the head end onto one of the sidings. A following train, consisting of 25 cars, with 10 cars airbraked, passed that yard board at such high speed as to require the assistance of the train ahead to enable it to stop, putting the company to some trifling expense for a new caboose, engine repairs, time of wrecking-crew, etc. After a thorough "inspection of the furniture" by those most concerned, the following rather incomprehensible edict went forth: Both conductors and engineman 30 days each; flagman discharged. It is not my province to criticise the decision in this case. I do know that

trains going in the opposite direction through the same yard stop, both for a railroad crossing and for orders, and that the rear end of a train so stopping is but a short distance from and in plain view of the official who gave the above decision; also that flagmen of trains so standing make no pretense of flagging at that point, and yet it is on a curve with the view generally obstructed by cars on adjoining tracks. I suppose the only conclusion I can come to is that "If the facts do not agree with the theory, so much the worse for the facts." LANGDON.

## Economies in Freight Car Repairs.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have not noticed that any one has as yet called attention to the relation between the subject of your recent editorial entitled "A Suggested Economy in Freight Car Repairs," and the series of letters which you are now printing on the subject of the proper design of freight yards, and yet the two subjects are closely connected.

Your editorial, in suggesting that the amount of

breakage to freight cars now occurring from rough handling in yards might be very materially decreased, gives very properly as the first method of decrease "Running trains through without breaking them up at the division yards." Now, the regular making up of trains of this kind, either solid for one destination or with the cars arranged in such an order as to reduce the shifting to a minimum, demands much better freight yards than we have in general in this country.

The second method which you suggest, that "the yardmen may be compelled or induced to handle cars more carefully," is also practicable only when the yard facilities are fully up to the necessities of the case. Now, in most cases the facilities of American yards, either through defective design or insufficient plant, or both, are only able to keep up with the work of the divisions between which they are situated by being worked at certain times, if not at all times, up to their full capacity, or even beyond what should be considered their full capacity, and this working to capacity is only obtained, as you very well express it, by making the pressure to rush work constantly outweigh the pressure toward the handling of cars carefully.

If I am right in these statements I cannot agree with that part of your editorial in which you say that this field for economy can be worked, not by increasing first cost, but by inexpensive changes in methods of administration, for I am certain that the freight yards of our railroads cannot be very materially improved without a good deal of expense.

Your editorials and consequent letters on the subject of the design of freight yards are, I trust, bringing this subject to the front. As soon as our civil engineers appreciate that a freight yard is a machine to accomplish certain ends they will doubtless show the same facility in mastering these ends and in planning the details of freight yards that they have shown in mastering the purposes of the permanent way and in designing its details. When we have a railroad with uniformly good yards fully up to any demands then we shall be in better shape to make a general saving in freight car repairs and also a saving in claims for breakable freight. Perhaps, indeed, some of the few railroads which have one or more good yards may be ready to start this reform at once. If this is the case it would seem to be quite practicable for them to pay the yardmen a premium for saving repairs exactly as on many railroads the engineers and firemen are paid a premium on saving coal.

Before this plan is made, however, it would seem that a change should be made in the methods of paying the yardmen. There seems no doubt that coal premiums have been practicable only because engineers and firemen are paid by the piece. Even as it is, the greatest difficulty that has been experienced with coal premiums has been with men who have been so economical in their use of coal so as to seriously affect the time they made on the road. Although engineers are paid by the mile it does not immediately follow that the more miles they run in a given time the more they will have to run. This is regulated by the number of cars to move and the number of engineers and firemen. It is true that at the end of a month or months if it is found that there are too many engineers and firemen, the number is reduced, but this contingency is not close enough to spur the engineer into making extra fast time with freight, if by doing so he will lose a coal premium. An engineer is compelled to make good time more by his desire and the desire of the trainmen to finish their work and get home, and if the desire for coal premium is stronger than the desire to get home the coal premium may seriously affect the capacity of a railroad.

Now, yardmen are not paid by the piece at all. They work their certain number of hours and then they go home, whether they have handled one train or one hundred. Naturally the less they do the less tired they are at the end of the day, and it takes a great deal of pressing on the part of superintendents and yard masters to keep the yards clear. Under these circumstances a premium for careful handling of cars, which may easily degenerate into a premium for slow work, might become a very dangerous factor. Should not our yardmen first be paid so much a car handled before they are paid so much for each car which is not repaired?

Thinking, as I do, that before much money can be saved in the repair of cars injured in yards, there must be, first, a very general reconstruction of yards, and, second, a change in the method of paying yardmen. I am hardly ready to go into an elaborate scheme to formulate a "Repair Premium."

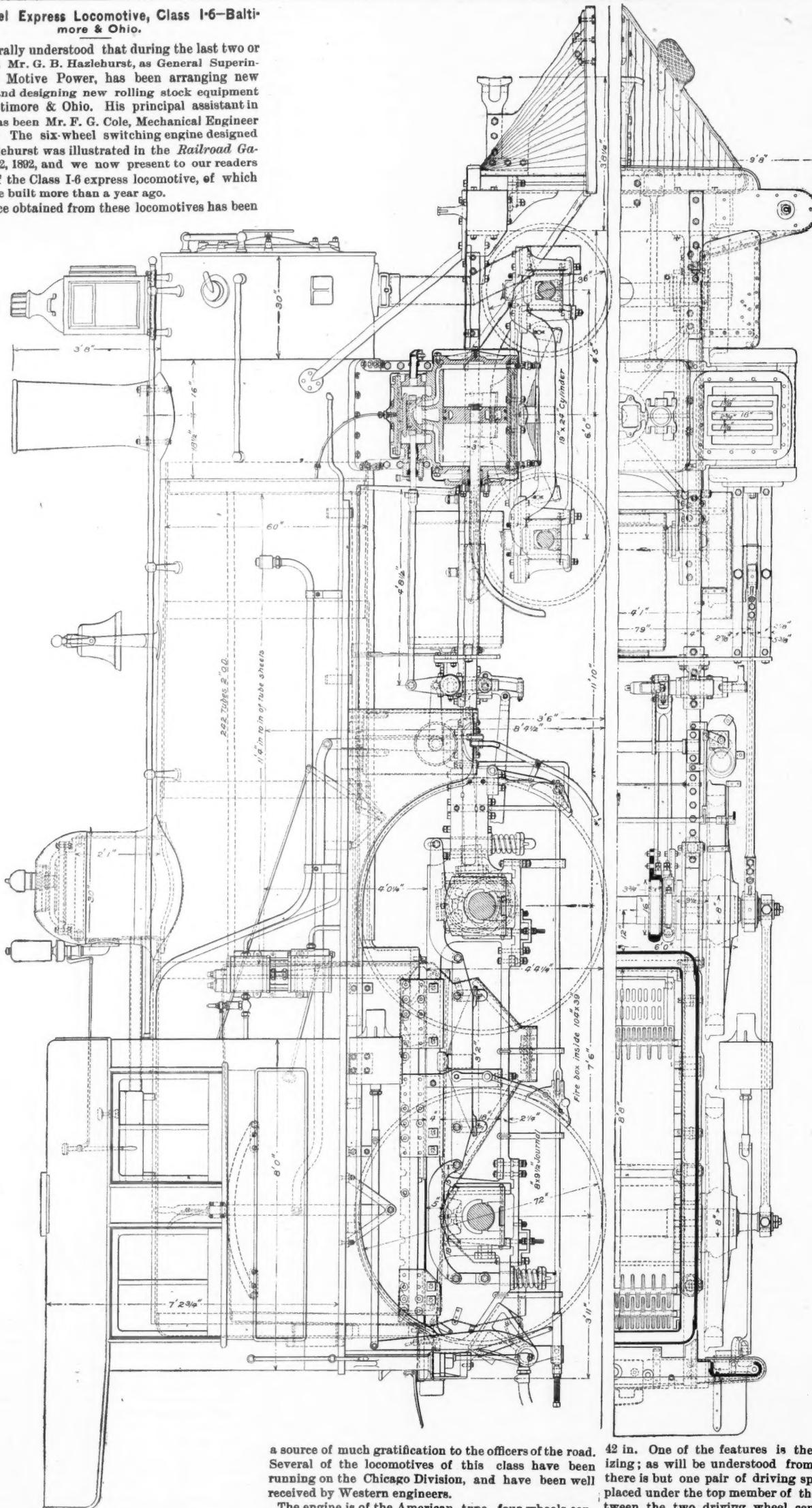
I think, however, that the clerical labor necessary to put into operation a system of paying yardmen by the car would go a long way toward the preparatory work necessary to establish a repair premium. Of course it would not be practicable to pay each yardman for the cars he personally handles, but it may be practicable to pay each yard crew for the cars they handle, although this can only be settled by experiment. There would be a decided advantage where there are two or more crews working in one yard if a generous rivalry could be created between them; first, as to the number of cars handled, and, second, as to the amount of repairs consequent on such handling, and if the initials and numbers of the cars handled by each crew were accurately recorded, it would only need a comparison of the repairs made to these cars to show the amount of repairs actually made necessary by the work of each crew.

T. C. P.

## Eight-Wheel Express Locomotive, Class 1-6-Baltimore & Ohio.

It is generally understood that during the last two or three years Mr. G. B. Hazlehurst, as General Superintendent of Motive Power, has been arranging new standards and designing new rolling stock equipment for the Baltimore & Ohio. His principal assistant in the work has been Mr. F. G. Cole, Mechanical Engineer of the road. The six-wheel switching engine designed by Mr. Hazlehurst was illustrated in the *Railroad Gazette*, July 22, 1892, and we now present to our readers drawings of the Class I-6 express locomotive, of which several were built more than a year ago.

The service obtained from these locomotives has been



EXPRESS PASSENGER LOCOMOTIVE. BALTIMORE & OHIO RAILROAD—CLASS I.6.  
*Mr. G. B. HAZELBURST, General Superintendent of Motive Power.*

a source of much gratification to the officers of the road. Several of the locomotives of this class have been running on the Chicago Division, and have been well received by Western engineers.

The engine is of the American type, four wheels connected, and four-wheel leading truck; the driving wheels are 72 in. in diameter, and the truck wheels

42 in. One of the features is the method of equalizing; as will be understood from the side elevation, there is but one pair of driving springs, and these are placed under the top member of the frame, midway between the two driving wheel centres. The weight is transmitted from the ends of the springs to hanging links which are suspended from bars that connect

adjacent ends of the equalizers over the boxes. From the other ends of the equalizers a link extends down through the frame to coil springs that bear on the under side of the frame. This method of support is a most excellent one. Suitable safety straps, suspended from the frame, are provided for the brake rigging, so that should any part become disconnected it cannot fall to the roadbed, where it would be likely to cause a wreck. The fulcrum for the reversing lever is supported by a bracket, extending down from the footboard. The method of connecting the tongue of the frame to the main frame is shown in the side elevation; the frame ahead of the front driving-box jaw has a jaw 4 in. deep, into which is inserted the end of the tongue, which is held in place by six through bolts and two keys to resist shearing. The sandbox is contained in the front wheel guard, one on each side; the arrangement is more clearly shown in the cross-section. The stack is of cast iron on a cast iron base. The convey pipe from the

These engines are undoubtedly among the most successful express engines of the day; they are easily making schedule time on divisions of the road where previously the schedule was made with difficulty. One of these engines is said, on good authority, but not officially, to have made 92 miles an hour for 10 consecutive miles with a six-car train.

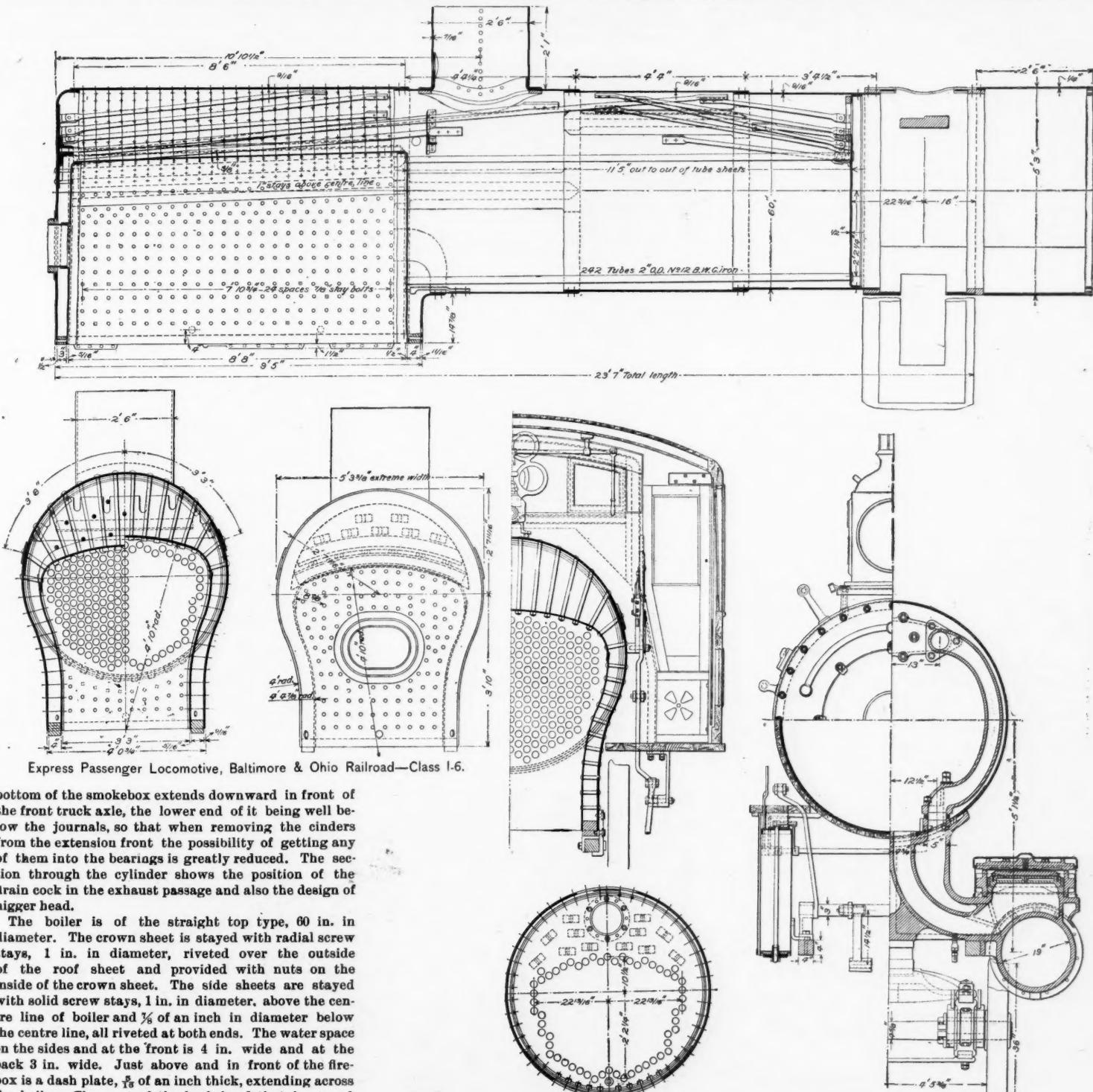
#### The Prevention and Control of Strikes on Railroads.

Among the papers read at the Railway Commerce Congress at Chicago one of the most striking was by Mr. E. W. Meddaugh, General Solicitor of the Chicago & Grand Trunk. The purpose of the paper is to outline a plan by which the cost and other terms of labor in business affairs, and particularly in railroad affairs, can be determined in advance and rendered certain for a reasonable period of time.

Mr. Meddaugh starts with the assumption, which must seem safe to all persons at all familiar with the

The ultimate remedy for unreasonable demands on the part of the wage earner will be the education of experience, through which he will learn that to injure the business of his employer is to injure his own interests; and on the other hand, the employer will learn that one condition of permanent prosperity is that the men shall be so treated as to have no just cause for complaint. Thus the true balance will be reached, but in the interim the law must be invoked to mitigate the evils incident to ignorance.

But assuming the equal right of labor and capital to determine the distribution of the profits of enterprise, we are met by one practical difficulty: Capital is always represented by a responsible body, natural or artificial; while labor has no association known to the law as its representative. Its organizations are without legal liability or pecuniary responsibility; they cannot make a contract that is enforceable; the employer cannot be sure that the terms made with the associations of the em-



Express Passenger Locomotive, Baltimore & Ohio Railroad—Class 1-6.

bottom of the smokebox extends downward in front of the front truck axle, the lower end of it being well below the journals, so that when removing the cinders from the extension front the possibility of getting any of them into the bearings is greatly reduced. The section through the cylinder shows the position of the drain cock in the exhaust passage and also the design of nigger head.

The boiler is of the straight top type, 60 in. in diameter. The crown sheet is stayed with radial screw stays, 1 in. in diameter, riveted over the outside of the roof sheet and provided with nuts on the inside of the crown sheet. The side sheets are stayed with solid screw stays, 1 in. in diameter, above the centre line of boiler and  $\frac{1}{8}$  in. in diameter below the centre line, all riveted at both ends. The water space on the sides and at the front is 4 in. wide and at the back 3 in. wide. Just above and in front of the firebox is a dash plate,  $\frac{1}{8}$  in. thick, extending across the boiler. The part of the back head that is stayed with diagonal stays is re-enforced by a plate  $\frac{1}{8}$  in. thick.

The following are some of the principal dimensions:

Cylinders.....	19 x 24 in.
Driving wheels, diameter.....	72 in.
"    number.....	4, coupled
Wheel base, rigid.....	7 ft. 6 in.
"    total.....	22 ft. 4 in.
Centre to centre of cylinders.....	79 in.
Out to out of frames.....	49 in.
Height, maximum.....	49 in.
Firebox dimensions.....	14 ft. 10 1/4 in.
"    diameter outside.....	39 x 104 in.
"    number.....	11 ft. 4 in.
Grate surface.....	2 in.
Heating surface, tubes, outside.....	242.
"    firebox.....	28.17 sq. ft.
"    total.....	1,436.06 sq. ft.
Travel of valve.....	132.88 "
Weight on driving wheels.....	1,568.92 "
"    truck.....	74,200 lbs.
"    total.....	39,500 "
Weight on driving wheels.....	113,700 "

problem, that organizations of wage earners are to endure and to increase in power with the growth of intelligence and education. The right of wage earners to band together for the purpose of securing just wages and just conditions of service is, he says, unquestionable, and they have a moral right to quit the service in a body when not bound by contract, and to refuse to re-enter it until their reasonable demands are granted. But they have neither a moral nor a legal right to forcibly interfere with any one else who may be willing to work for the wages or on the terms which they rejected. The attempt by force to prevent others from accepting these terms is tyranny in one of its worst forms; and still less can it be tolerated that the men should take possession of their employers' property and assume to control it. The logical development of this would be anarchy.

ployed will be permanent, and is without legal remedy for any breach of their agreements. This situation is prejudicial to both sides, for it discourages capital from engaging in enterprises and causes its representatives to shrink from making terms through the labor associations. It is then of primary importance to labor that its representatives should be legally incorporated, with officers who have power to enter into contracts, for breach of which they shall be legally liable and pecuniarily responsible; with power in the corporation to enforce penalties against members who violate agreements. With such a body the representatives of capital could safely deal.

Mr. Meddaugh does not discuss the question as to whether the workingmen can be forced to organize under a law designed to bring about these ends, but he thinks that it is quite feasible to draft an act for the

incorporation of wage earners which shall protect their rights and interests as well as those of their employers. Such relief, he thinks, should be sought through state legislatures and not through Congress. It is possible that Congress has power to enact a general law for the incorporation of wage earners who are engaged in work connected with Interstate commerce; but it is not necessary or desirable that it should do so. The subject can be more comprehensively dealt with by the states.

But there is a radical difference between the railroad employé in his relations to the business he is serving and the wage earner in general in other departments of labor. The latter may be permitted more freedom to disregard his contracts of service than is consistent with the public interest in the case of the former. Mr. Meddaugh points out the quasi-public nature of a railroad corporation which is permanently dedicated to the public service. Its duty being to serve the public impartially and faithfully, and it being manifest that this duty can only be performed through the agency of men in its service, the obligation of the men while in the service must be coextensive in kind with that of the corporation, and it is believed that this will be adjudged to be the law whenever the question is properly raised in the state or national courts. While the common law power of the courts to enforce the obligation of railroad employés will enable them to do more than has been generally supposed, it is a reproach to our lawmakers that the relations between the companies and employés, and the duties of the latter, have not long ago been specifically defined and regulated by statute.

This subject, Mr. Meddaugh holds, belongs properly to Congress under its power to regulate commerce, and cannot be adequately dealt with by states. He then cites cases and judicial opinions to illustrate the scope and character of the powers of Congress and the kind of control which Congress may exercise over the instrumentalities of commerce by land, including the services of those employed in the work of transportation. Broadly speaking it may be safely affirmed that Congress may, by law, impose any duty or promote any act which is necessary to secure or promote the efficient service of the carrier in the transportation of traffic between the states and between the United States and foreign nations; and this power extends to railroad companies lying entirely within one state if they are engaged in interstate commerce. The complete remedy, then, for railroad strikes, so far as the law can supply a remedy, is clearly within the power of Congress, and the path is a beaten one, which involves no new and untried theory. It simply involves the same measure of protection to commerce by railroad as has been extended to commerce by water.

There was a mild recognition in the Interstate Commerce law of the propriety and necessity of some legislation on this subject. It is there provided that the agents and employés of a railroad company shall be punishable for willfully neglecting or refusing to perform the duties devolving upon them in respect to accepting and carrying traffic. Judges Taft and Ricks, in the Ann Arbor case, simply applied the appropriate legal remedy under this provision. But while this provision of the Interstate law is in the right direction it falls far short of the full measure of relief that the situation demands. Further legislation is necessary if the policy expressed in this provision of the act is to be continued and carried forward. The railroad companies should be required to make written agreements with the employés, covering all the terms of service, including a definite period of time. It would greatly facilitate such agreements to have the employés organized into a corporation under a law, but this may not be necessary. It may be practicable to secure a separate agreement with each employé. This will depend on the action of the associations of which the men are members. While the law should embrace all railroad employés and all persons who handle or carry freight between the carrier and a shipper or consignee, it should also provide that any act, of persons not in the service of a railroad company, aiding in obstructing commerce shall be punishable even more severely than the employés themselves.

Some such legislation as has been outlined has become most important, not for the railroad companies and their employés alone, but for all branches and kinds of industry. It is asserted that the railroad companies have made all concessions in the way of wages that their business will allow, and it is predicted that if further exactions are made in this direction they will not be yielded to, even if the alternative is a total suspension of the train service. Such a result would be unendurable to society. Therefore, while under normal conditions men may not be forced into the railroad service, if they have voluntarily entered it they must comply with such terms as the public interest imposes. This is simply a necessary incident of the business.

Finally, Mr. Meddaugh is hopeful that relief such as he has suggested may be obtained from Congress, if organized and systematic effort is made to enlighten the popular mind, and to make that part of the public not engaged in railroad service see and feel its great interest in the regular and unobstructed movement of railroad traffic, and he urges an educational campaign to this end.

On the whole, this paper is a singularly clear and valuable contribution to the literature of a most perplexed

subject. While we are not as hopeful as Mr. Meddaugh appears to be of the rapid spread of knowledge of facts and of correct opinion among the voters, and from them to the lawmakers, we have little doubt that he has pointed out the way in which relief will eventually come.

#### Electric Welding of Rail Joints.

It is hardly necessary to dwell upon the desirability of abolishing rail joints. Could this be accomplished the resulting economy in first cost and in cost of maintenance would be enough to justify a very considerable outlay. We have recently spoken of the experiments which are going on, especially on the Norfolk & Western, with rails 60 ft. long, by the use of which one-half the joints are got rid of, and so far with no serious disadvantage either in transportation of the rails or in laying them, or from expansion. A more extensive and radical experiment is now going on, it being the welding of considerable lengths of rail into one continuous rail. At the meeting of the American Street Railway Association, held at Cleveland last October, Mr. A. J.

was tested for alignment, as well as for linear expansion, and found perfect.

Upon the assurance of this result the Johnson Company built 3,000 ft. of track in Johnstown, Pa., the joints of which they welded up solid, and although this track has been subject to a range of temperature of 30 deg., no linear or lateral motion has been observed. This track was built last May.

With this encouragement the company has obtained a contract from the West End Street Railway of Boston to weld together sixteen miles of track in Cambridge, and is now engaged in the execution of that contract, the welding machinery being of the Thomson Electric Welding Co.'s make. The track has been laid, and is in constant use for about two years, and the welding is now being done without disturbing the track or paving except to remove a few paving blocks at the rail joint. The rail is a heavy girder rail about 8 in. deep.

The old fish plates are first removed, and the ends of the rails freed from rust and scale by a hand emery wheel on a flexible shaft and operated by an electric motor. A thin piece of steel of the same shape as the rail section is driven tightly between the rail ends to insure contact. Then the joint is ready for welding, which operation can be best explained by describing the welding machine.

Two illustrations are shown: (fig. 1) A general view of the car which contains the whole welding plant, and (fig. 2) showing the welding machine itself at the moment a weld is being made. The power necessary to the operation of the car and plant is taken in the form of electricity from the trolley wire over the track. This current is employed directly to propel the car, to operate the derrick by which the welding machine is moved, to run the emery wheels before mentioned and to actuate a large motor-dynamo inside the car. The operation of welding requires a very different current of electricity from that required to drive cars or for lighting. A current for lighting and motive power generally requires a high potential (pressure) and a low quantity, while welding requires an enormous quantity and a low potential. The reason of this, as explained by the company, is that if the potential were high the current would run around or leap across, while the low potential current goes straight through the weld. The passage of such an enormous quantity through the weld heats it to a white heat when the welding is effected by forcing the pieces together by a screw press shown in (fig. 2).

The current from the trolley wire is of 500 volts potential and is too high pressure to use for welding and must be converted to a lower potential. This is done by the motor-dynamo before mentioned. This machine takes the 500-volt direct current of the trolley wire and converts it into an alternating current of 300 volts potential. But this current is not what is wanted to make a weld. This alternating current is in turn conducted into a transformer shown at T, fig. 2, which reconverts it into a direct current of very low potential and very great ampérage (quantity\*).

This current is then conducted from the transformer T fig. 2, through a thousand strips of copper shown at A, to the secondary poles ss and through the fish plates and the web of the rail.

The forcing of this great current of electricity through the plates and rail causes heating sufficient to produce a white welding heat in two or three minutes, seen at W, fig. 2. The poles in contact with the white-hot fish plates are kept cool by a jacketing of water circulated

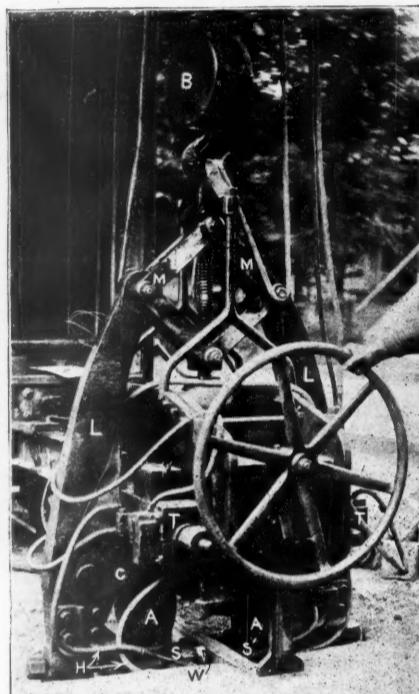


Fig. 2—Electric Welding Machine.

Moxham, President of the Johnson Co., presented a paper which attracted a good deal of attention, in which he reported the results of experiments made at Johnstown, Pa., with very long rails. It may be well to recapitulate briefly what those experiments were and the results. A section of 1,100 ft. of track was carefully laid with the rails closely butted and joined together with fish plates five ft. long. Each pair of plates was bolted to each rail with nine 1 1/4-in. bolts, machine turned, in

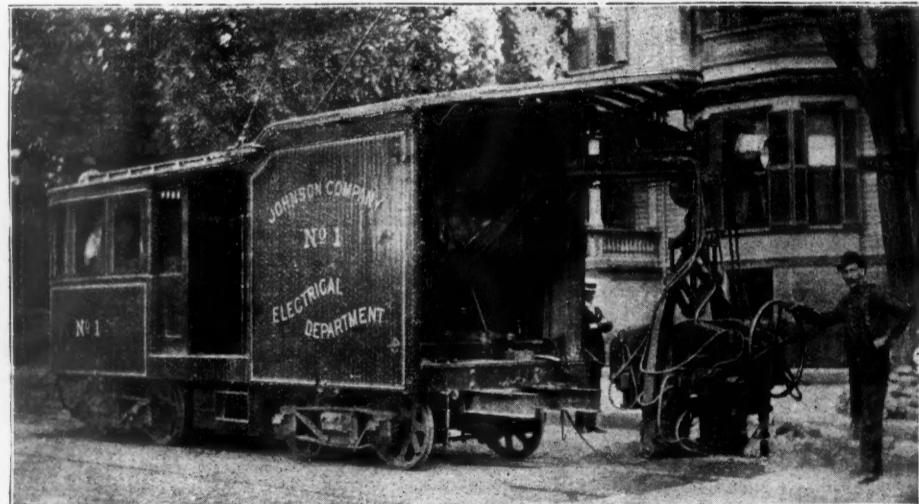


Fig. 1—Portable Electric Welding Plant.

reamed holes, and the track was laid in macadam pavement. Every day for one year three observations were taken of this piece of track and no movement discovered, although exposed to the low temperature of winter and the high heat of summer. Mr. Moxham concluded that the paving packed about the rails of street car tracks prevented any change of the track either in length or alignment; that whatever linear expansion took place was expended in compression and consequent enlargement of the rail section, and that the paving prevented any lateral motion or buckling of the track. The track

through the pipes H. When a welding heat is obtained the pressure is applied by a few revolutions of the hand wheel, shown fig. 2, and the fish plates are forced against and cemented to the web of the rail. This pressure is accomplished by a system of levers, clearly shown in fig. 2. The hand wheel in the foreground is geared to the vertical screw shown in the middle of the machine. This screw is double-acting, right and left threaded, and when turned it draws together the upper and lower corners of the diamond-shaped lever frame,

\*Estimated at 4 volts and 40,000 ampères.

shown in the upper part of fig. 2. Such a motion forces apart the extreme corners of the diamond and the upper ends of the heavy side lever arms LL, to which they are connected. The arms LL being connected by tie-rods C cannot separate so that the lower end of the side lever arms must approach, the force exerted depending upon the position of the tie-rods and the obliquity of the diamond frame.

The poles of the transformer ss, the tie plate w and the web of the rail are between these lever jaws. By such an arrangement of levers and screws, a small force applied to the hand wheel exerts a pressure of 40,000 lbs. at the weld. Under this pressure a perfect union of the pieces is obtained and the welding completed. The current is then cut out, the machine of fig. 2 is lifted by the electric derrick, as shown in fig. 1, and the operation is repeated at another joint.

A few points deserve special notice: It should be made clear that the rails themselves are not welded together, each to each, but that the adjacent rails are welded to the same pair of fish plates. Each rail is welded separately, it requiring two welding operations at every joint. The fish plates are quite unlike the usual form employed in railroad construction. They are 4 in.  $\times$  7 in and 1 in. thick, with a  $\frac{1}{8}$  in. lug running the width of the plate. This lug is flattened down under the pressure and affords materials for the weld. If, when the weld is made and it is still red hot, the track is not quite straight and true, a few blows with a sledge will bring the rails into their correct position. Rail joints thus welded do not require wire connection to insure the passage of an electric current.

A proposition to weld rails on steam railroads where the track is exposed and the rails are not held by the

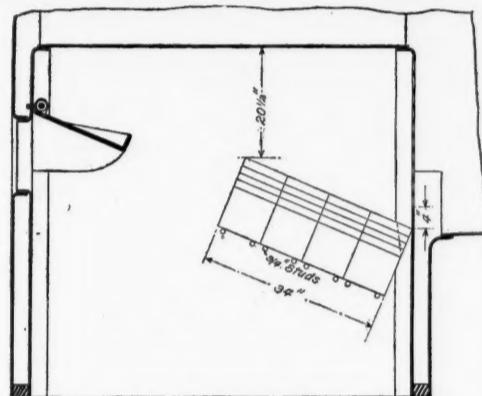
stage. Not long ago an American roadmaster recorded his experience with steel ties, showing that the cost of maintaining such track was *much lower* than on a similar piece of road laid with wooden ties. In fact, the report was so favorable that men in this country who have had many years practical experience in such matters came to the conclusion that there was a mistake somewhere. Other men, equally experienced no doubt, both in America, and Europe, declare that the use of metal ties increases the maintenance charges, while some have even gone so far as to assert that it is *impossible* to maintain a good road when metal ties are used. Inventors should not lose heart at this, for although at present India can boast of a much greater mileage of track laid with metal ties, than any other country, and the percentage so laid continues to increase, their introduction has not been effected without difficulty. Fifteen years ago very few Indian engineers or roadmasters advocated the use of metal ties, and section foremen and workmen were very averse to their use. Even now, there are many who prefer hard-wood ties, but as material of this description is difficult to obtain in large quantities, and is rapidly rising in price, they are compelled to use metal ties.

To argue that a good track *cannot* be maintained with metal ties in the face of what is being done here is absurd. Engines weighing nearly 80 tons, freight trains weighing 1,000 tons and many of the fastest trains in India have been running over metal ties for years, and not only are the maintenance charges, both on account of labor and renewals of material, very low, but the track is also quite as smooth as any wooden road.

Good stone ballast, the harder the better, is, in this country, considered a *sine qua non* wherever metal ties

have given good results, has been ruined by the designer's anxiety to save a few pounds of metal on each tie, and this at a time when the weight of both rails and rolling stock is being steadily increased. Want of stability is one of the most common defects, but this will no doubt be eliminated by degrees when railroad men in all parts of the world recognize the fact that some type of metal tie must be used, even if the construction of new lines is restricted, or abandoned altogether. At present many who should be interested in this question are not disposed to take any action until compelled by the force of circumstances to do so, and in England the sidetracks leading into workshops where thousands of metal ties are manufactured every year are still laid with fir ties imported from Norway. Light rails and metal ties do not go well together, and nothing under 70 lbs. per yard should be used for fairly heavy traffic when metal ties are the standard.

*Rail Joints.*—For many years all Indian railroads were laid with even joints, but broken or staggered joints have gradually crept into favor during the last three or four years, and some of the largest systems have decided that for the future all new steel is to be laid with broken joints, as there is less knock or jolt when the rails are laid in this way. None of the joints on broad gauge lines are supported in any way, as the fish-plates are not allowed to touch the cross ties; still we have no trouble with broken plates, and very few complaints about low joints. The old pattern, 18-in., splice-bars, gave way to 25-in. angle bars, with six one-inch bolts, a few years ago, but on some railroads these last have fallen into disfavor, and 22-in. plates of the same pattern, with four 1-in. bolts, are now the standard. Several nut-locks and lock-nuts have been experimented



Location of Brick Arch in Locomotive Firebox, C. & N.W. Ry.

pavement, on both sides, as is the case on street railroads, would at once meet several objections. Serious buckling under expansion would be expected, and the question of the difficulty of renewals would at once arise. The latter difficulty could only be met by cutting the joint or by dividing the welded joints by the action of the welding machine; yet the advantages that would come from such a wholesale elimination of joints are so great that the experiments now being made at Cambridge will be watched with great interest.

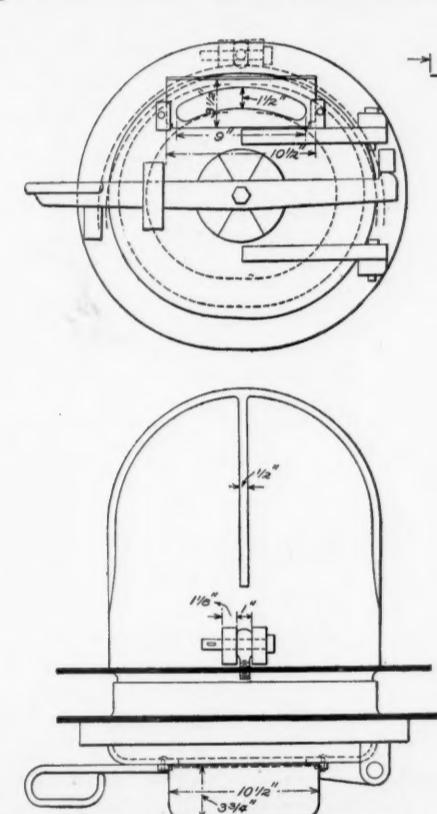
The apparatus is as yet experimental, and although extremely compact and ingenious in design, will probably be improved and perfected as the company gains experience in its use.

#### Smoke Preventing Device Used on the Chicago & North Western Railway.

The accompanying cuts illustrate quite clearly the design and application of the smoke preventing device used on the Chicago & North Western Railway to which a reference was made at the recent Master Mechanics' Convention by Mr. William Smith, Superintendent of Motive Power and Machinery of that road. The construction of the device, as will readily be seen, is very simple, and quite similar to one that has shown excellent results in stationary service. The arrangement consists of a short brick arch located in the usual manner in the front end of the firebox, and a cast iron hood or deflector hinged above the fire door. There is also a slot in the upper side of the fire door through which air may be allowed to pass freely into the firebox. The air entering through this slot passes down along the under side of the deflector, thus becoming somewhat heated, and is mixed at the end with the gases which arise from the grate, and pass backward under the arch. The slot in the door is never closed while the engine is working, but only when being fired up. It has been found that in order to make a success of this arrangement the brick arch must run back to within 18 in. or two feet of the end of the deflector, and that the deflector should be in line with the bottom side of the brick arch.

#### Indian Railroad Notes.

*Metal Ties.*—Indian permanent way engineers who know what can be and is being done with metal ties, are often amused at the extraordinary difference of opinion regarding their utility, economy, etc., which appears to exist in countries where the use of such material has scarcely advanced beyond the experimental



Deflector for Locomotive Firebox, C. & N.W. Ry.

are used, and although the consensus of opinion is, that the cost of tamping for the first year or two is greater than with wooden ties, it has been proved beyond dispute that when once properly bedded they give less trouble and require less attention than wooden ties; in fact, they sometimes, in cuttings and on level ground, become *too solid*, and it is found necessary to loosen the ballast with picks, especially when the stone used is mixed with any fine material. Many experienced English permanent way men object to hard stone ballast unless mixed with chips or gravel, although they use wooden ties only; but, when properly trained, Indian workmen can tamp almost any type of metal tie with black trap or basalt broken into cubes varying in size from half an inch to two inches, and make a thoroughly good track without the aid of anything smaller as ballast.

With many types of metal ties the track can not be tamped in the centre, as the plates, or bowls, only project from  $1\frac{1}{2}$  to 2 ft. on each side of the rail, but even when—as with most patterns of steel ties—there is space for this, it is never done, and the centre of the tie is not allowed to bear on the ballast. On the 5 ft. 6 in. gauge the tamping extends for a distance of 1 ft. 9 in. on each side of the rails, and about 2 ft. in the centre is left free.

To expect metal ties to compete on equal terms with wooden ties in a well wooded country like America, so far as first cost is concerned, is unreasonable, and, when the long life of a properly designed metal tie is taken into consideration, unnecessary.

Many a type which possessed good points, and ought to

with, but none appear to have found favor; the principal reason being that there is very little difficulty in keeping the ordinary nuts tight, and as the government regulations insist upon track walkers being employed, the same man is made responsible for the keys and bolts.

*Travel of Rails.*—The creep or travel of rails is a subject that appears to crop up every two or three years, and many learned dissertations on the subject have lately appeared. Some still assert that when laid on a gradient they travel down hill; but this certainly does not apply to double track roads where the traffic on each line of rails is in one direction. In such cases the rails invariably travel in the same direction as the trains, and although they do not travel so fast on a rising as they do on a falling gradient, they do, nevertheless, travel up hill on gradients of 1 in 80, and this is no doubt general wherever the traffic continues in one direction for any length of time. Indian experience also proves clearly that, where all other conditions are equal, rails of heavy section travel less than rails of light section, owing to their deflecting less under the load. In this country the travel, or creep, of rails is a never-ceasing source of trouble on double track roads, and every hot season several cases of buckling occur, in spite of the precautions taken.

In order to show the difference of travel between heavy and light rails, one case out of many may be quoted. A perfectly level section of double-track road, with an average of 20 trains daily in each direction, had the up line laid with rails weighing 82 lbs. per yard, and the down line laid with rails weighing 10 lbs. less per yard. The ballast, ties, joint fastenings, etc. were precisely the same in each case, but in one year the heavy rails traveled 4 in., and the lighter rails 6 in. in the direction of the traffic.

With the same amount of traffic the rails have been found to travel rather more than 2 in. per month on a falling gradient of 1 in 100, while the rails of the same section, on the opposite track, traveled less than  $\frac{1}{2}$  in. per month against the grade.

In each of the cases quoted the rails were double-headed, and could not therefore be secured to the ties except by the addition of special fastenings. Many remedies have been tried, but so far none have proved effective; and the section men have long stretches of track to draw back every year, in order to regulate the space between the rail ends and give each tie an equal amount of work, as the rails when traveling push the ties out of position.

*Working Expenses.*—The following figures, taken from the report of one of the best managed metre gauge railroads, may be interesting to some of your readers.

Working expenses, equal to 35 per cent. of total income, viz.:	
Steam flotilla	3.82 per cent.
Maintenance of way and works	6.60 per cent.
Locomotive expenses	9.91 per cent.
Carriage and wagon department	2.31 per cent.
Traffic expenses	7.10 per cent.
General charges	6.36 per cent.
Law charges, rents, compensation, etc.	0.90 per cent.
Total	35.00 per cent.

The last three would be hard to beat. We do not pay damages for cattle killed on the track, but the owner usually has to pay a fine of Rs. 5 per head for allowing his cattle to trespass on the railroad, and in many cases impounded cattle are sold to cover cost of keep, etc., as the owners decline to pay the fees necessary to release them. Most railroads are protected from the inroads of cattle by a four or five wire fence, but villagers often loosen the wire or the standards and then turn the cattle onto the track, where the grass is generally more luxuriant than it is in the adjoining fields.

*Thefts of Material.*—Large quantities of permanent way material are stolen every year, as villagers and

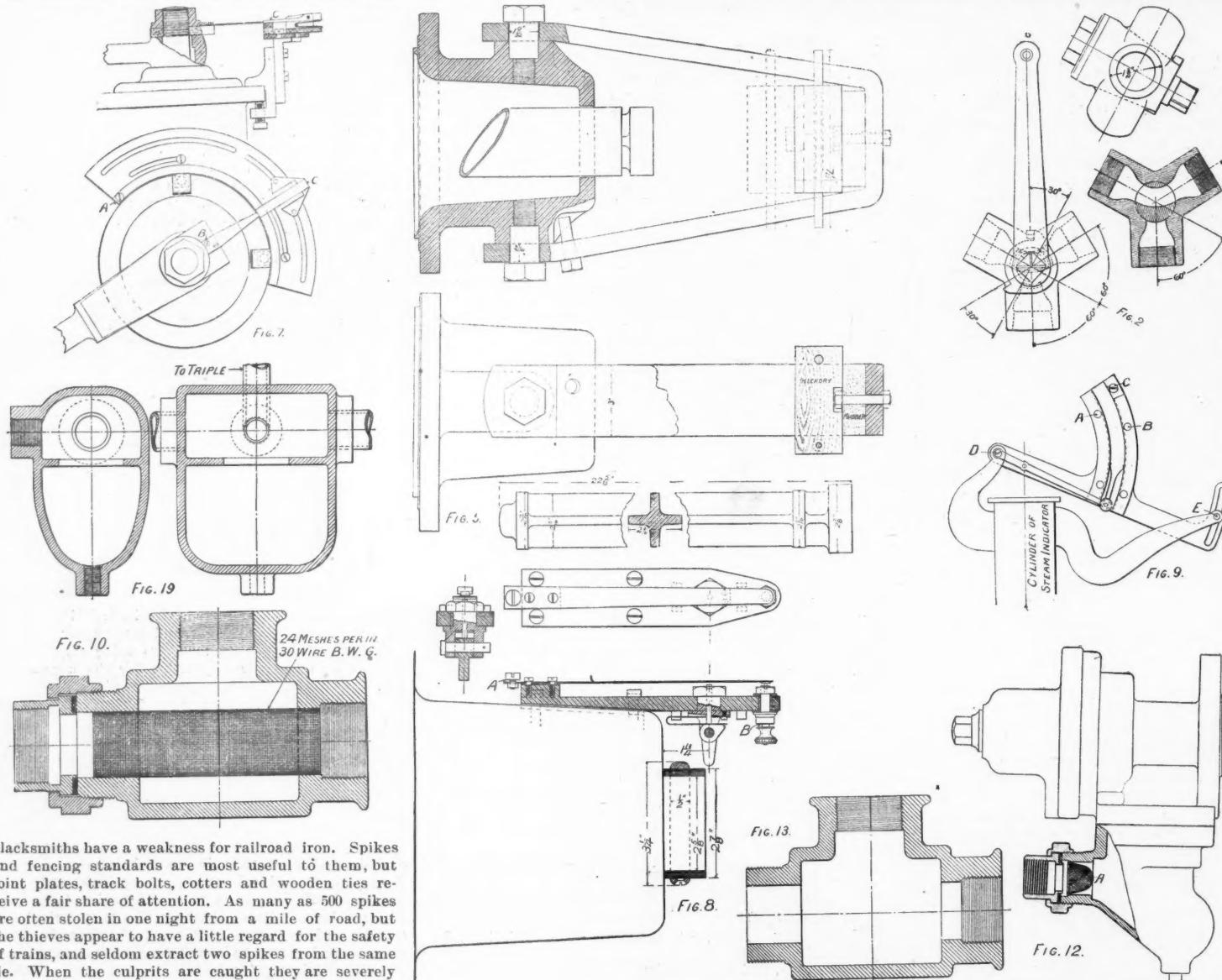
over to your committee a building completely fitted with every detail desired, and which may be briefly described as follows:

The building is 40 x 80 ft. put up in a very substantial manner with timber framing; the outside covered with corrugated sheet iron, of which material the roof covering is also made; the inside of the building is sheathed with wood. In a small annex is located a vertical boiler of abundant capacity to work the air pumps and heat the building; it is constructed to carry a steam pressure of 160 lbs, and is fitted with all the necessary appurtenances.

The main building contains at the present time one test rack upward of 64 ft. in length, constructed of timber framing and erected to carry two sets of 50 freight airbrake cylinders and auxiliary reservoirs, each set with a complete outfit of tender and driver brakes with their auxiliary cylinders and two main reservoirs. Room is provided at one end for two air-compressing pumps and two engineer's brake valves; one of each of these only is now in place. 100 brake cylinders and auxiliary reservoirs received from the Westinghouse Air Brake Company are placed in two horizontal rows of 50 each, one above the other; the upper set only is fitted with triple valves of the standard Westinghouse quick-acting type; the lower set is not fitted with triples, as that is the one upon which the triples which are to be

der is fitted with a device for limiting the stroke of the piston. This device consists of a hinged strap which is attached to the cylinder head and which can be thrown into a vertical position and out of the way when a full stroke of 12 in. is to be had; when the 6-in. stroke is to be used the straps are thrown into a horizontal position and wooden blocks dropped into them, against which the piston rod strikes and limits the stroke. A small rubber plug is introduced in the end of the strap and acts as a buffer, and reduces the shock. To obviate the danger of fracturing the head, the Westinghouse Air Brake Company very kindly had special heads made of exact thickness and double the number of bolts by which the head is fastened to the cylinder. The blocks used are 2 in. in thickness, and when it is required to limit the stroke to 4 in., one additional block is introduced into each strap. In order that the force of the blow should be taken directly on the piston and not on the end of the tube-shaped piston rod, special cast iron push rods were made and introduced which offer some considerable surface at the outer end to receive the blow. When the full stroke of the piston is to be had and the straps are thrown out of the way, the push rods are removed. These details are shown in fig. 5.

As it is necessary to obtain correct records of the time elapsing between the movement of the engineer's brake



ENGRAVINGS WITH THE REPORT OF THE COMMITTEE ON AIR-BRAKE TESTS—M. C. B. ASSOCIATION.

blacksmiths have a weakness for railroad iron. Spikes and fencing standards are most useful to them, but joint plates, track bolts, cotsers and wooden ties receive a fair share of attention. As many as 500 spikes are often stolen in one night from a mile of road, but the thieves appear to have a little regard for the safety of trains, and seldom extract two spikes from the same tie. When the culprits are caught they are severely punished, but detection is very difficult, as the stolen material is generally buried until the outcry is over; and, when it is being used up, men are always on the watch to guard against a surprise visit from the police.

*The Weather.*—The oldest inhabitant cannot remember ever having experienced such a season as we are now having. Heavy rain and a delightfully cool atmosphere during April and May are quite a novelty for Bengal. Some of the crops have been damaged, but it is too early in the season to predict what the result will be.

NUT-LOCK.

CALCUTTA, May 23, 1893.

#### Air-Brake Tests—Report of the M. C. B. Committee.

The full report of the committee of the Master Car Builders' Association is issued with the illustrations, and although we published important extracts from it at the time of the convention, no illustrations were then available, and we therefore reprint it now in full.

In your committee's report of last year attention was called to the fact that it was lacking in an essential feature necessary for successfully carrying on the investigations assigned it, namely, a pipe rack, gauges, recording apparatus, competent assistants, etc. It was also stated that the Pennsylvania Railroad had offered to establish for the Association at its Altoona shops a complete set of brake-testing apparatus for the purpose of investigating and reporting upon the different triple valves now on the market or which may develop in the future. It gives your committee great pleasure to announce that this promise is now an accomplished fact. On May 1, 1893, the Pennsylvania Railroad turned

tested are to be placed: both sets have, however, all the other attachments required for service. The piping is the standard for 34-ft. freight cars, of the same diameter of pipe and same length of pipe as used in service; it is fitted with the standard angle cocks, air-brake hose and couplings, the standard drain cups and stop cocks, and with the same number of elbows as used in the service; the only addition is a three-way cock, shown in fig. 2, connecting the 1-in. branch pipe with the two sets of brake cylinders. This addition was necessary, as it was concluded that, in order that both sets of brakes and triples should be tested under precisely similar conditions, only one set of train pipe should be used for both. The 1-in. three-way cocks are connected to the triples by means of 1-in. rubber hose. The pipes for the engine and tender equipment are of standard size and lengths, and arranged as nearly as it was possible to do so in the same manner as used on a consolidation locomotive.

The test rack containing the two sets of 50 brakes is placed to one side of the building in order that at some future time a second rack facing it may be erected in the same building, and thus make it possible to test 100 sets of brakes at one time. The arrangement of the racks with piping, etc., is shown in figs. 3 and 4, which are illustrations from photographs and in which fig. 3 is an interior view looking from the first car to the fiftieth and showing the upper and lower horizontal rows of cylinders; fig. 4 is an interior view looking from the fiftieth car toward the first car and showing the double set of hose connected to the single line of piping.

In order that the provisions of the specifications for the testing of the airbrake apparatus recommended by last year's committee should be carried out each cylinder

valve when applying the brake, the movement of the twenty-fifth piston, the movement of the fiftieth piston and the attainment of 55 lbs. pressure in the fiftieth cylinder, special apparatus had to be introduced, and as these time intervals are very small it was, of course, necessary to make use of electricity for transmitting the movement of the various parts to the recording apparatus. The record is obtained by means of a chronograph, consisting of a paper-covered drum driven by a weight through a train of wheels, uniform speed of the drum being controlled by a pendulum governor; the chronograph is made by Fauth & Co., of Washington, D. C., and is of great accuracy. Fig. 6 is an illustration from a photograph. In front of the revolving drum is placed a carriage which contains the marking pen and the electromagnet necessary for moving this pen; the carriage is moved in the direction of the axis of the drum and parallel to it by means of a screw driven by the same train of wheels which drives the drum, in such a way that were the pen not moved by the electric current it would trace a continuous spiral on the paper with which the drum is covered, which, when the paper is removed from the drum, appears as a series of parallel lines ruled upon it. In order to obtain records as nearly instantaneous as possible, a closed electrical circuit is used; in other words, the various devices located upon the engineer's brake valve and the brake cylinders in transmitting the movement of the apparatus, break the otherwise continuous circuit and release the armature of the electromagnet on the chronograph. This armature is attached to a small lever, at the other end of which is mounted the pen, and allows a spring to pull it away from the magnet every time the current is broken and the arma-

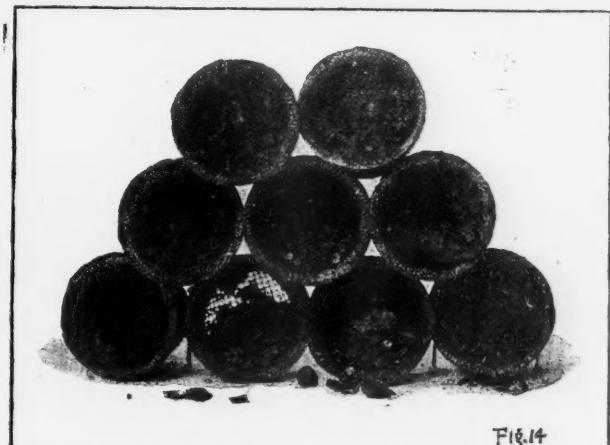
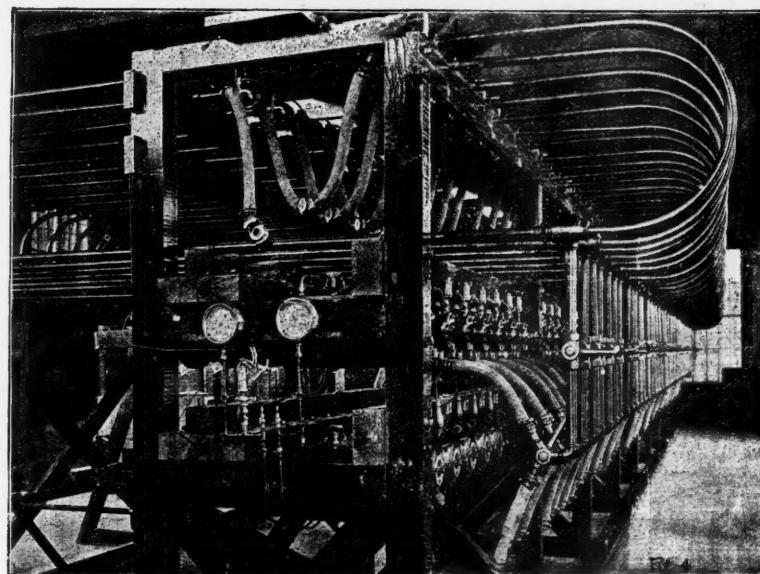
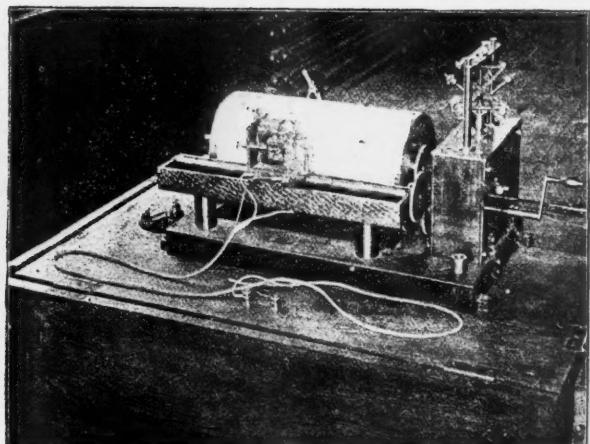
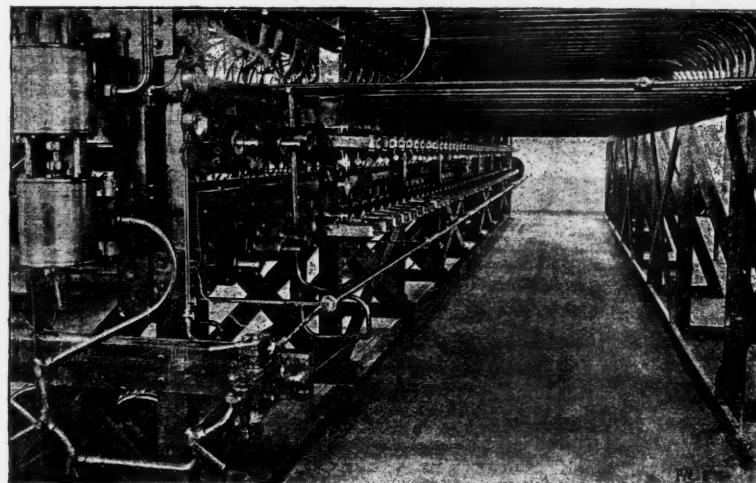


Fig. 14

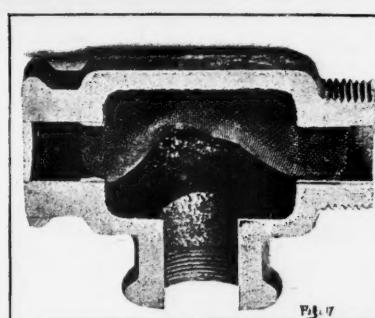


Fig. 15.

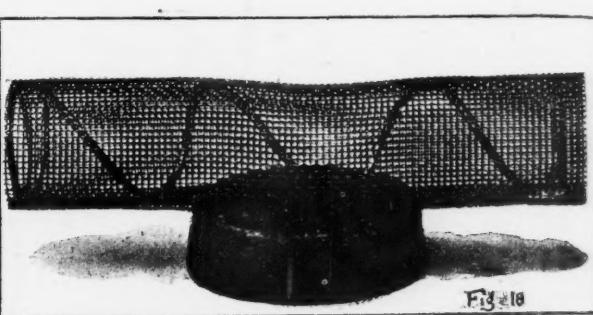
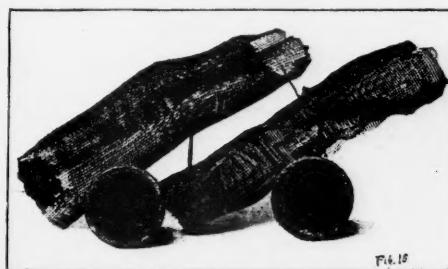
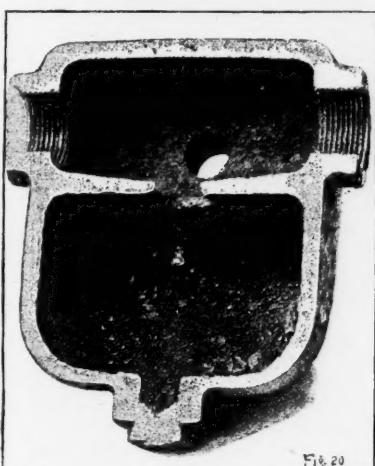


Fig. 18

ENGRAVINGS WITH THE REPORT OF THE COMMITTEE ON AIR-BRAKE TESTS—M. C. B. ASSOCIATION.

ture is released, the pen makes a corresponding movement in the opposite direction, and makes a little jog in the otherwise straight line traced on the paper drum; as the circuit is broken by the movement of the various parts of the apparatus in applying the brakes a series of jogs is traced upon the paper, and as the speed of the drum is constant, a measurement of the distance between jogs in the line indicates the time elapsing between the movement of the various parts.

The circuit-breaking device placed upon the engineer's brake valve is shown in fig. 7, and consists of a curved

metal frame attached to brackets by which it can be clamped to the engineer's brake valve; and of a contact spring which is attached to the handle of the valve. Upon the curved plate, but insulated from it, is placed another small metallic arc on which the outer end of the contact spring bears. This superimposed arc and the contact spring are both in the circuit by being attached to the line wire at the points *A* and *B*; therefore, so long as the spring remains in contact with the arc the circuit remains unbroken, and the movement of the handle of the engineer's brake valve will not be recorded on the chronograph so long as the spring and the arc remain in contact. In order to break the contact the spring is lifted up from the small arc below it; this is accomplished by means of a small plate of hard rubber marked *C*, which is wedge-shaped at that end which bears on the arc, so that when the contact spring is moved toward the thin edge of this plate it is lifted up and breaks contact, but immediately makes it again. As the handle of the engineer's valve has to be moved back again, and it was thought desirable not to introduce the confusion of other jogs in the line on the chronograph, except those which actually show the movement of the parts of the apparatus, the contact spring on its return with the movement of the handle travels under the hard rubber plate *C*, which slips over it.

The circuit-breaking devices used on the twenty-fifth and fiftieth cylinders for recording the movement of the

pistons are identical, and are shown in fig. 8. It is placed upon the cylinder head, and consists of a strong plate attached to the cylinder head, having attached to it the various parts of the circuit-breaking apparatus. The hollow piston rod on these two cylinders has a projecting ring attached to it near the outer end. As the piston rod travels outward it comes in contact with and deflects the pendant arm of a small bell crank; the horizontal arm of the bell crank at the same time imparts a vertical movement to a small pin, which in its turn lifts a spring and breaks the electric contact which exists at the end of the spring; as soon as the ring on the piston rod has passed the bell crank, the latter is moved back again by the spring and the circuit immediately closed. The line wires are connected at the point *A* on the spring, and the point *B* on the seat, upon which the other end of the spring rests, and which forms the contact point with the latter. For the same reason that it was not desirable to have the circuit broken again when the pistons travel back and false records made on the chronograph, the bell crank is deflected in the opposite direction when the piston travels home, but produces no movement of the spring, and, therefore, does not break the circuit.

The circuit-breaking device for recording the attainment of 55 lbs. pressure in the 50th airbrake cylinder is shown in fig. 9, and consists principally of an ordinary steam engine indicator with its piston and carefully graduated spring. With the increasing pressure in the

cylinder, the small piston in the indicator is moved upward and compresses the spring, so that equal increases of pressure result in equal compressions of the spring. The piston is attached to a lever which partakes of its movement, and at the outer end of this lever is attached a pair of delicate contact springs which travel between and bear upon two metallic arcs insulated from the frame which carries them. These arcs are in the circuit, by being connected at points *A* and *B* to the line wire. At the upper end of the arc *B* is placed a hard rubber block *C*; so long as the contact springs travel between and bear upon the two metallic arcs the circuit remains unbroken, but the moment it rises above the upper end of the arc *B* and one spring bears upon the hard rubber block *C*, the circuit is broken and the record made on the chronograph. The frame which carries the metallic arcs is pivoted at *D* to the frame of the indicator, and the other end is adjustable at the point *E*, and can be set to any position, so that it is possible to obtain record on the chronograph of the time at which any pressure is reached in the 50th cylinder. This, therefore, enables very careful adjustment to be made.

Besides the apparatus above described, the rack is fitted with the requisite number of gauges as required on the cylinder and auxiliary reservoir of the first, twenty-fifth and fiftieth cars.

Your committee last year submitted for consideration a schedule or table entitled "Standard of Efficiency of Airbrakes." It was not recommended for adoption by the Association. The tables were intended only as an outline to be worked over and improved upon; nor is your committee prepared at the present time to submit any final recommendation. The inauguration of the World's Fair has stirred the different airbrake companies up to

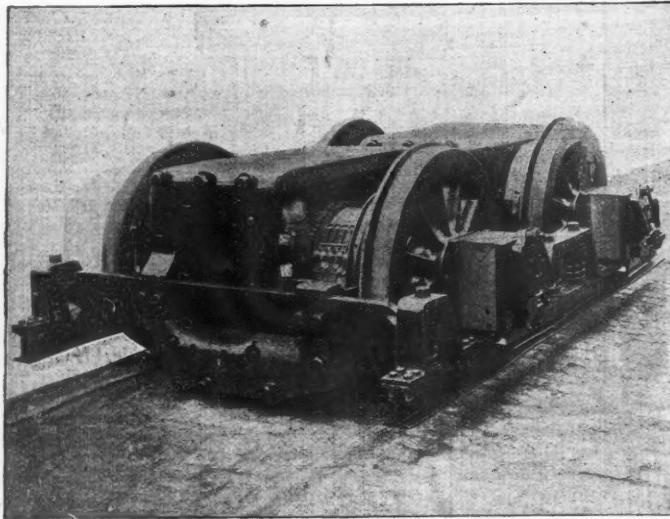
of the best and most ingenious devices that have been invented have been ruined by neglect. Let us then consider whether there are any tests of airbrake service that should be claiming our attention. At this meeting we have representatives from almost every railroad company in this country. Only once a year are we privileged to criticise and to personally call each other's attention to details of practice. This will always be one of the great advantages of the Association, for it is through our members that we are able to reach the thousands of men on whose care and attention to maintenance depend largely the success and usefulness of the various measures and devices we as a body have endorsed.

The mechanism of the triple valve is fine and delicate, and if not properly cared for will for obvious reasons soon become inefficient. Various efforts have been made to keep the dust, dirt and rust that accumulate in the train pipe out of these delicate parts. The first attempt at keeping this dirt out of the triple we find in a horizontal or vertical screen located in what is known as the train-pipe drain cup, as shown in fig. 10. Formerly this drain cup was packed all around the screen with small pieces of sponge. Fig. 11 shows one of these drain cups; it is packed with sponge all around the screen. The sponge has become so solid it is difficult to pick out. A perforated brush is intended to prevent the sponge from going into the pipe leading to the triple. At the entrance to the triple, as a further precaution, we find a cup-shaped screen, as indicated in fig. 12 at *A*. With the advent of the quick-action brake it was found very essential to reconstruct the train pipe and its connections, removing all sharp corners, angles and obstructions that existed, the sponge in the drain cup among other things being banished as not conducive to

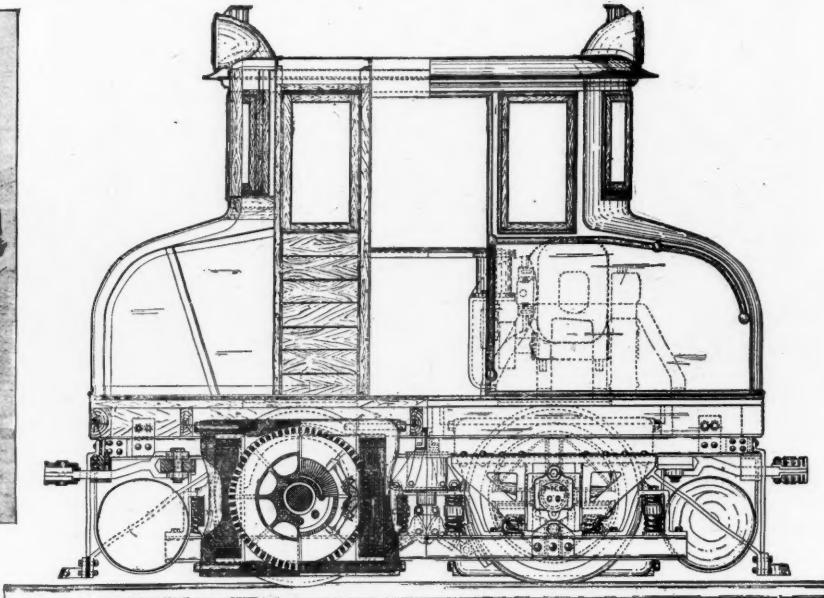
without any inspection or attention must not expect any better results than are obtained from those that are allowed to run without any screens. Those of us who examine into this will find that the netting rusts and cuts out, and filth accumulates in quantities that is almost beyond belief. Fig. 15, from photographs, shows the collapsed condition into which the screens get when they become gummed up and worn out. It also shows the fine condition the sponge gets into when by long service it is thoroughly mixed with rust, oil and dirt. All sponge should be removed at once from drains cups, not only from freight cars but from passenger cars.

Fig. 16 shows two triple screens removed from triples that had drain cups originally fitted with screens without sponge, but the screens had become misplaced. Apparently the screens were too long and were bent when the piping was screwed up. They were in this bent and flattened condition when removed from the drain cups. Air and dirt passed by without going through the screen, the result being shown by the condition of the triple screens. They are packed solid with dirt, and are just as bad as those shown in fig. 16. Fig. 17 is a very interesting case; it shows a screen still in position, but which from some cause has collapsed and partly assumed an upward position, and is rapidly getting coated over with rust and dirt. Fig. 18 shows a method by which this collapsing of screens might be averted. It will be observed that this is accomplished by simply inserting a piece of coiled wire. The arrangement is not patented, and any one may use it.

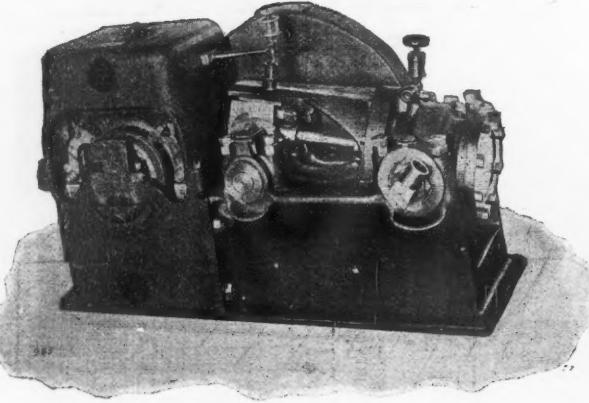
Fig. 19 shows the tank drain cup which, as you know, is not fitted with the quick-action brake. Up to the present time, we believe, there has been no attempt on the part of any of the brake companies to use screens



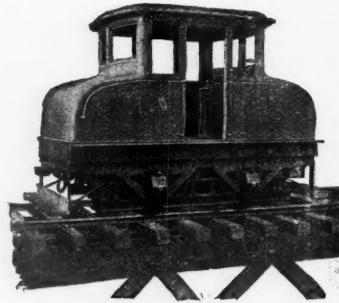
Motor Truck.



Side and Sectional Elevations.



Electric Air Compressors.



General View.

Built by the GENERAL ELECTRIC COMPANY, Lynn, Mass.

the importance of becoming exhibitors, and showing their apparatus in operation as nearly as can be under similar conditions to actual train service. The thousands of railroadmen who attend the World's Fair this year will find a most wonderful exhibit of quick-action airbrakes and recording apparatus, the latter so essential in measuring performances the value of which is computed in seconds and fractions of a second. Four brake companies have exhibits of racks represented as being the equivalent of different numbers of 34-ft. cars in service. Two companies show the equivalent of 50 cars and two actually show the equivalent of 100 cars. Such an opportunity for investigating the relative merits of so delicate a device has never before been presented to mechanics. These devices will be on exhibition six months. It is expected that much information will be gathered through the various experts who will examine them during the coming summer. It is well known that additional care magnifies defects in brakes that are not apparent in a small number. Your committee's rack so far is provided for but 50 cars. In view of the information likely to be gathered from these World's Fair exhibits it was therefore thought prudent not to attempt at establishing a final "Standard of Efficiency" at the present time, but to report progress, ask to be continued and defer a final report until 1894.

There are other matters, however, in investigations of this kind which must not be lost sight of. In the assignment of duty to your committee it will be observed that much stress is laid on the importance of carrying on the brake investigations in such a way as will insure "the best available service." Shop investigations are very important, but they are of little value unless associated with tests of service. Some

quick action. Either through neglect or through zeal in the pursuit of quick action, some drain cups have been put in service not only without sponge but without any screen, as shown in fig. 13. Let us see the effect of this by examining some triple screens that were removed from freight cars so fitted after a few months' service by one of the members of your committee, shown in fig. 14. It will be observed that the screens are packed in some cases perfectly solid with dry mud and dirt so that it is impossible for any air to pass through them. The composition of the material seems to be chiefly dust, pipe scale and rust. In one case you will observe a chunk of coal about  $\frac{1}{8}$  in. long and approximately cubical. Clearly, then, it is not desirable to do away with the screen in the drain cup, and the screen at the entrance of the triple is also a most important auxiliary in contributing methods for the best available brake service, but how many of our inspectors would miss this screen if triples were issued to them without the screen? A case has come to the attention of your committee where 20 triples were inadvertently issued at one shop without any screens and every one was put in service without the screen. With such carelessness and want of attention is it any wonder that brakes are sometimes reported as not working?

Let us, however, return to the consideration of the drain cup. We hope, through this exhibition of triple valve screens removed from triples not protected with drain cup screens, we have succeeded in showing how important a part a properly screened drain cup plays in the successful working of a quick-action airbrake. It must be borne in mind, however, that everything eventually wears out on a railroad, and the master car-builder who allows the screens in his drain cups to run

in tank drain cups. The lower cavity is supposed to collect all passing dirt and water, and this is intended to be removed by blowing off through the small pet cock. In practice we believe it will be found that the opening to the pet cock soon stops up, the cavity fills up with mud and dirt, and the drip cup is then of practically no value. Fig. 20 shows one of these cups as removed from a tank of an engine on the C. B. & Q. R. R. It will be observed the cock is gone and the hole plugged with dirt, and the cup well filled with dust and dirt. That this dirt will work its way into the triple must be evident from the illustrations already cited.

To sum up, we advise as follows:  
First—Remove all sponge from drain cups.  
Second—See that screens in drain cups and in triples are properly maintained and of proper mesh.  
Third—Apply screens to all tank drain cups.

G. W. RHODES,  
S. P. BUSH,  
GEORGE GIBBS,  
A. S. VOGT,  
E. A. WILLIAMS,  
Committee.

AURORA, Ill., June 15, 1893.

#### A 30-Ton Electric Locomotive.

The General Electric Company has just completed at its Lynn works, and will exhibit at the World's Fair, an electric locomotive designed for moderately fast, light railroad work. The motor weighs about 30 tons complete; is 16 ft. 6 in. long, 11 ft. 6 in. high, and 8 ft. 4 in. wide over all. The drawbars are 2 ft. 6 in. from the top of the rail. The drivers are 44 in. in diameter, and the machine is designed for a normal speed of 30 miles an hour. The drawbar pull is estimated to be 12,000 lbs. The company brings out this machine as a serviceable one for elevated railroads and for passenger and freight service on the minor steam railroads. The description which follows is furnished to us by the General Electric Company, and the engravings will give a fair general notion of its construction.

There are two electric motors of especial design and construction, one on each axle. The motors are gearless, and are supported on spiral springs resting on the side frames of the locomotive truck. This method of suspension leaves the wheels free to adjust themselves to the irregularities of the roadbed.

The motor fields consist of massive iron castings, to which the hollow field spools are bolted. The armatures are of the iron clad type, having each separate winding

embedded in a mica-lined slot cut into the curved surface of the laminated iron armature body. The axles of the locomotive pass through the hollow shafts on which the armatures are mounted. These shafts rest in bearings of the motor frame, and are connected to the axles by universal couplings, which allow of freedom of motion in all directions. The commutators are of massive construction, and there are four sets of brushes to each commutator.

The motors are controlled by means of a series parallel controller, set up in the interior of the cab. This device embodies all the latest improvements made in this type of apparatus by the General Electric Company. It is found that this controller allows of a more gradual and easier starting of the electric motor, and the speed can be more delicately and instantaneously controlled than in the case of the steam locomotive.

The truck, suspended from the journal boxes, is constructed of heavy I-beams, on which is the cab, of sheet iron, the interior finished in hard wood. Two sliding doors are placed at each side of the cab, and the windows are so arranged as to permit of an unobstructed view in all directions. There is ample space in the cab for the motorman's movements. The position of the headlights is shown in the line engraving.

Air for the brake is supplied by a special electrical air compressor, which also operates the whistles. This air

The designs for this locomotive were made by Mr. W. H. Knight, Chief Engineer of the Railroad Department of the General Electric Company. Mr. Knight has been connected with the development of electric railroads from the first, and was one of the firm of the Bentley & Knight Electric Company, which built the conduit road in Cleveland and the Allegheny road in Allegheny, Pa. The success of the General Electric Company in railroad work has very largely resulted from Mr. Knight's labor.

#### Stability of a Trestle Bridge—Effects of a Flood.

BY EMILE LOW, M. AM. SOC. C. E.

The construction of a branch line does not usually call for an expensive class of work, and is generally governed by the magnitude of the prospective traffic. The bridging as a rule is as cheap as is considered expedient, of course due regard being paid to the character of the moving load. The accompanying plans and views of a trestle bridge designed and erected under the supervision of the author, on a branch line of a prominent Southern railroad, are not presented as embodying any extraordinary design as to novelty, but merely to show the behavior of such a structure when exposed to the action of a severe flood.

The structure is composed of four spans, two of 12½

#### Papers for the Engineering Congress.

We give below a partial list of papers that have been prepared for the International Engineering Congress of the Columbian Exposition, and which have been presented to and accepted by the Committee of the American Society of Civil Engineers.

##### Bridges.

The Continuous Superstructure of the Memphis Bridge, by George S. Morison, M. Am. Soc. C. E.

Comparison of Modern Engine Loading with Standard Specifications for Spans from 10 to 200 ft., by C. D. Purdon, M. Am. Soc. C. E.

##### Canals.

The Enlargement and Improvement of the North Sea Canal of Holland (Amsterdam Ship Canal), by A. E. Kempees, C. E., Royal Engineer in Holland.

Notes on Projects for the North Sea Canal from 1629 to 1893, by A. Huet, C. E.

##### Cements.

On the Manufacture and Testing of Portland Cement, by Henry Faifa, M. Inst. C. E.

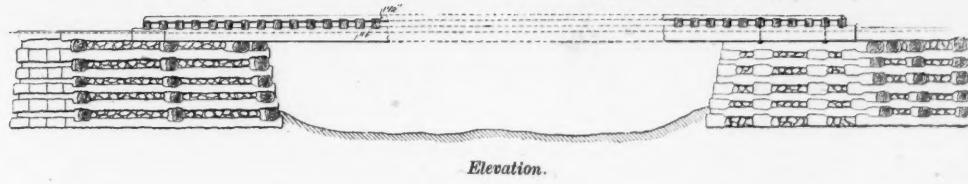
##### Foundations.

Bridge Substructure and Foundations in Nova Scotia, by Martin Murphy, D. Sc., C. E., etc., etc.

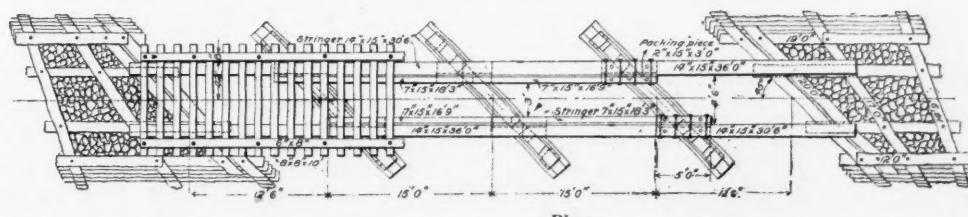
Improved Method of Constructing Foundations Under Water by Forcing Cement Into Loose Sand or Gravel by Means of Air Pressure, by Fr. Newkirch.



Flood Effects on a Trestle Bridge.



Elevation.



General Plan—A Trestle Bridge on a Skew.

#### STABILITY OF A TRESTLE BRIDGE.

ft. and two of 15 ft., the abutments and bents being on a skew of 45 deg. The abutments are in the form of cribs and built of round logs of about 12 in. diameter. These cribs are filled with stone. The bents are framed of 12 in. x 12 in. timber. The foundations of the bents are two 12 in. x 12 in. pieces laid side by side and bolted together. These foundation pieces are well bedded and held in place by 1-in. drift bolts, driven into the underlying material from 12 to 24 in., depending upon its character and hardness.

The structure is one of a number built over a turbulent mountain stream, having a fall at this particular point of 100 ft. to the mile, the grade on the trestle bridge being the same. The valley through which the stream flows is narrow, with steep hillsides covered with a dense growth of timber. Owing to logging and lumbering operations considerable refuse timber of all kinds and sizes line the creek bed.

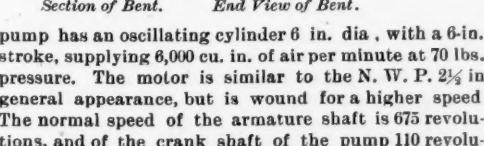
A short time ago (the early part of May, 1893) an unusual flood occurred in this stream, the water of which brought down a large quantity of drift wood, which lodged against the bridge and dammed up the water to such a height as to cause it to flow over the top of the bridge. How well the bridge resisted this pressure, which must have been enormous, is well illustrated by the two views taken a few days after the occurrence, and before any repairs were made.

CEDAR BLUFF, Va., May 15, 1893.

#### The World's Fair of 1900.

Nobody has had such experience and has developed such capacity in organizing great exhibitions as the people of Paris. They have already begun arranging for the World's Fair of the year 1900. Last November the Minister of Commerce appointed a commission to study the question of the arrangement of railroad tracks and terminals to handle the passenger business, and the matter is now under consideration.

#### Section of Bent. End View of Bent.



pump has an oscillating cylinder 6 in. dia., with a 6-in. stroke, supplying 8,000 cu. in. of air per minute at 70 lbs. pressure. The motor is similar to the N. W. P. 2½ in. in general appearance, but is wound for a higher speed. The normal speed of the armature shaft is 675 revolutions, and of the crank shaft of the pump 110 revolutions. The dimensions of the air compressor are: Length, 41 in.; width, 16 1/2 in.; height, 25 in. The pump motor is controlled by a special rheostat. This, by an intermediary device, is automatically regulated by the air pressure.

The company says: "The use of these locomotives over very long distances is at present limited only by the cost of long lines of electric feeders, and until the problem offered by this condition is solved restriction of its employment must necessarily exist. But for places comparatively near each other and where traffic is dense—the denser the better—the electric locomotive is peculiarly adapted, for here all the advantages of electric propulsion are available, unhampered by the extreme expense involved in long feeder lines."

"At first electric locomotives will probably be used in elevated railroad service. They will then probably be adopted as feeders to the trunk lines, both for freight and passenger traffic, and to operate short suburban lines, where a rapid, efficient service is requisite. Their peculiar fitness for switching purposes will advance their use another step, and then slowly, as the different problems presented are overcome, they will invade the province of the trunk line steam locomotive, and the millennium of railroad travel will be within the realities of life."

#### Geodesy and Hydrography.

Topographic Surveys, by Herbert G. Ogden, Assistant U. S. Coast Survey.

Recent Experience on the U. S. Coast and Geodetic Survey in the Use of Long Steel Tapes, by R. S. Woodward, C. E.

Terrestrial Magnetism in North America, by Chas. A. Schott, Assistant U. S. Coast and Geodetic Survey.

Historical Notes Upon Ancient and Modern Surveying and Surveying Instruments, by H. D. Hoskold, M. and C. E.

Fundamental Units of Measure, by T. C. Mendenhall, Superintendent U. S. Coast and Geodetic Survey.

##### Metals: Their Treatment for Structural Purposes.

The Treatment of Metals for Structural Purposes, by James Christie, M. Am. Soc. C. E.

The Use of Mild Basic Steel as Material for Construction in Germany, by C. Weyrich, Government Architect in Hamburg.

A Proposed Method of Testing Structural Steel, by Alfred E. Hunt, M. Am. Soc. C. E.

The Use of Mild Steel for Engineering Structures, by George C. Mohrtens, Government Architect, Bromberg, Prussia.

##### Navigation and Transportation.

Inland Transportation, by Capt. F. A. Mahan, U. S. A.

Navigation Works Executed in France from 1876 to 1891, by M. F. Guillain, Inspecteur-Général des Ponts et Chaussées, etc., etc.

##### Railroads.

On the Gauges of Railroad Track in General, with Special Consideration of Narrow-Gauge Railroads, by E. A. Ziffer, C. E.

Transmission of Power in Operating Cable Railways, by Robert Gilham, M. Am. Soc. C. E.

A New Method of Calculating Cross-Sections of Roads and Railroads, by Francisco Da Silva Ribeiro.

Distinctive Features and Advantages of American Locomotive Practice, by David L. Barnes, M. Am. Soc. C. E.

Railway Signaling, by G. Kecker, of Germany.

Common Roads, Railways and River Communications in Portugal, by Frederico Augusto Pimental, C. E.

The Rearrangement of the Railway Terminal System at Altona, with Special Reference to the Avoidance of Grade Crossings, by R. Cesar, Building Counselor to the Royal Prussian Government.

Surveys for Railway Location, by F. A. Gölbeck, Baumeister, Cologne.

Railroads of Mexico, by E. Prieto Basave, M. Soc. Engineers and Architects of Mexico.

The Rearrangement of the Railroad System at Cologne, by F. Lohse.

Railroads in New South Wales, by Thomas F. Birrell, C. E.

Study for Railways from Guadalajara to the Pacific Ocean, by S. V. Pascal, M. Soc. Engineers and Architects of Mexico.

##### River and Harbor Improvements.

The Improvement of Harbors on the South Atlantic Coast of the United States, by William Murray Black, Captain Corps of Engineers U. S. A., M. Am. Soc. C. E.

History of the Conversion of the River Clyde into a Navigable Waterway, and the Progress of Glasgow Harbor from Its Commencement to the Present Day, by James Deas, C. E., Engineer Clyde Navigation.

The Limits Attainable in Improving the Navigability of Rivers by Means of Regulation, by H. Engels, Professor of Hydraulics in the Royal Technical High-School at Dresden, Germany.

The Development of Quay-Crane in the Port of Hamburg, by Chr. Nehls, Hydraulic Director at Hamburg.

The Plant of Maritime Commercial Ports of France by H. Despres, Ingénieur des Ponts et Chaussées.

A Brief Account of the Building of Leixoes Harbor, by

Alfonso Joaquin Nogueira Soares, Inspecting Engineer in Charge.

Description of the Lower Weser and Its Improvement, by L. Franzius Ober-Bau-Director.

Method Used to Secure the Stability of a Quay-Wall at the Port of Altona, on the Elbe, in Germany, Which Had Shifted Its Position After Completion, by Berthold Stahl, Stadtbaudirektor.

*Severage and Drainage.*

Purification of Sewage and of Water by Filtration, by Hiram F. Mills, A. M. C. E.

The Sewage System of Milwaukee and the Milwaukee River Flushing Works, by G. H. Benzenberg, M. Am. Soc. C. E.

*Water-Works.*

Experience Had During the Last 25 Years with Water-Works Having an Underground Source of Supply, by B. Salbach, Government Engineer, Dresden, Germany.

Some Questions Concerning the Filtration of Water, by W. Kummel, C. E., Altona, Germany.

Possibility of Increasing the Water Supply from the Soil for Purposes of Irrigation and of Augmenting the Flow of Rivers, by G. H. Otto Volger.

On the Distribution of Water in the City of Mexico, by L. Salazar, M. Assoc. of Engrs. and Archs. of Mexico.

*Miscellaneous.*

American Grain Elevators, by E. Lee Heidenrich, Member Scandinavian Engineering Society of Chicago, Am. Inst. Mining Engineers, Western Society of Engineers.

Manufacture and Use of Paving Brick, by Daniel W. Mead, Member Western Society of Engineers, Assoc. M. Am. Soc. C. E.

Carbon and Its Uses in Electrical Engineering, by Clarence M. Barber, C. E., Member of the Civil Engineers' Club of Cleveland.

The Relative Merits of Working Hoisting Machinery by Steam, Water and Electricity, by George A. Goodwin, Senior Vice-President of the Society of Engineers; Assoc. M. Inst. of Civil Engineers.

The Electric Light Plant of Guadalajara, by Rafael M. de Arrozarena, M. Am. Soc. of Mexican Engrs.; M. Assoc. of Engrs. and Architects of Mexico.

Practical and Aesthetic Considerations in Laying Out of Cities, by F. Stubben.

In addition to the above the following papers have also been received, and will be presented by title:

The Calculation of Railroad Bridge Stresses, by John L. P. O'Hanly, M. Am. Soc. C. E.

The Tequixquiac Tunnel, by Louis Espinoza, M. Assoc. of Engrs. and Archs. of Mexico.

The New Railway Stations in Dresden, by C. Kopcke and O. Klette.

The Sewerage and Drainage of the Town of Coimbra, by J. C. De Costa, J. da C. Couraca and J. F. de M. Bessa, Engineers.

The Improvement of the Harbor of Lisbon, by J. J. de Matos.

A Method of Making Mountain Railways Economical, by Ugo Baldini, M. Soc. of Italian Engrs. and Archs. Rome.

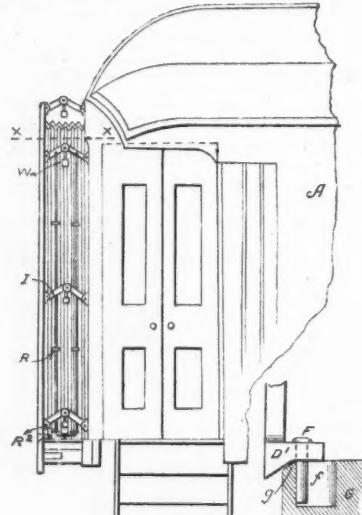
Determination of Uniform Methods for Testing Building and Construction Materials, by J. Bauschinger.

The North and East Sea Ship Canal; History and Construction, Commercial and Military Aspects; the Baltic Lock; the Sand-Dams in the Beng-Kudensee Low Lands, by M. Fulischer, Chief Executive Engr. and Member of the Canal Board.

The Best Form of Level Book, by A. T. Walmisley, M. Inst. C. E.

**The McKeen Vestibule.**

Herewith is shown an illustration of the McKeen Vestibule (recently patented), or so much as Mr. McKeen claims as his invention. One purpose of vestibules is to



The McKeen Vestibule (Patented).

make a cinder and dust-tight passageway between passenger cars, and to insure this it is necessary that the face plates of two adjacent vestibules should be kept closely pressed together. Those who have carefully watched the working of vestibules have noticed that on curves and when the couplers are under great draught the vestibule face plates are drawn apart, leaving a space or gap be-

tween, through which smoke and dust enter. Mr. McKeen undertakes to prevent this by making the face plate adjustable.

To accomplish this he makes the face-plate footing loose or free to move longitudinally with the length of the train. His device is shown at fig. 3, a side view of the face-plate footing where it is attached to the platform as at R<sup>2</sup> fig. 1.

The buffer-plate G has an oblong hole cast or cut, in which a bolt f moves back and forth. This bolt f passes



Crossing at Harvey, Ill.—Diagram of Signals.

through the foot of the plate D<sup>1</sup> and limits the movement of the foot to the length of oblong slot. The foot D<sup>1</sup> of the face plate is beveled, and the footing g upon which it rests is chamfered to an incline, so that the face plate tends to slide down and work out from the platform to meet the abutting plate of its companion vestibule.

Having fastened the face plate to the platform so it has a free longitudinal motion, the next step is to keep the face plate crowded out from the platform, and this is accomplished not with springs, but by weights. The plate is attached to the frame of the vestibule by hinged pieces, as shown at I, figs. 1 and 2. Weight W, hung at the joint, tends to draw down the joint and to extend the length of the two pieces in a straight line, thus moving the plate out from the frame and crowding it against its neighbor. The heavier the weight the greater the thrust.

The joint or hinge between the pieces is shouldered by lugs to prevent the two pieces from becoming quite straight or bending down, for if that were allowed to occur the weights would have an effect contrary to that desired.

At R and R<sup>2</sup> are shown rings through which are passed cords that are attached to these jointed lever arms just mentioned. These cords are to assist in folding the cloth between the plate and frame.

It will be evident that when the buffer springs contract and the plate is pressed nearer its frame the joint of the small connecting pieces will rise, and that two points on these pieces will approach one another. If these strings that pass through rings in the folds of the curtains are passed through holes in the jointed pieces, they will be made to approach each other whenever the curtains should fold to adapt itself to the narrowest space. These strings are to prevent the bunching of the cloth and to make it fold evenly.

Mr. McKeen is about to have one of these vestibules built to test the value of his inventions, when we shall hope to hear more from them.

**Signaling and Interlocking at Harvey, Ill.**

The illustration shows the plan of the interlocking and signaling now being put in for the Illinois Central Railroad, the Chicago Central Railroad, and the Chicago & Grand Trunk Railroad, at their crossing at Harvey, Ill., by the Johnson Railroad Signal Company. This is a very important crossing, and one which causes great delay to all roads using it, the Illinois Central especially, by reason of the great number of trains on its line which pass this point.

The interlocking requirements of the three roads are considerably different. The Illinois Central Company has separate levers for every signal and does not use selectors. It also requires facing switches to be provided with facing point locks, which permits the use of

switch and lock movements with derails. The Chicago Central and the Chicago & Grand Trunk allow the use of selectors and switch and lock movements on facing point switches where they can be used.

The tower is being erected by the Chicago Central, and will contain spaces for 68 levers; 50 of these levers are now to be put in; 12 spaces are left for a proposed plan for future extension of the system, and there are six spare spaces. Of the 50 levers, 19 control six switches, 19 switch and lock movements, and four foulings bars. Six levers control 10 facing point locks and seven foulings bars. Two levers control movable point frogs, and 23 levers control 25 signals. The number of levers necessary to be operated to pass a train ranges from four to eight. Ample space has been left for an additional track on the Chicago Central Railroad.

The work is now well under way, and the plant will be put in use as soon as possible.

**The Johnson Railroad Signal Company at the World's Fair.**

The Johnson Railroad Signal Company has a handsome exhibit at the World's Fair. The space occupied by the company is covered by a platform about 12 ft. above the floor, upon which are placed a 40-lever No. 1 standard interlocking machine and a considerable number of the appliances manufactured or controlled by this company. Near the centre of this platform and on a smaller platform about 8 ft. higher are three other machines one of four, one of eight, and the other of 12 levers.

The space beneath the main platform is occupied by signal levers, sections of track, signals of various forms, and special parts. The 40-lever machine which stands on the main platform is one that was installed about a year ago at Auburn Junction on the Chicago & Western Indiana Railroad and taken out recently to be replaced by a larger machine of the same type. All but one of the signals above this platform are worked from this machine, as are also the switch and facing point locks on the main floor beneath. There are also on this platform four Webb & Thomson staff instruments for single line working, and four Tyer's train tablet machines illustrating their method of electric interlocking on single track roads.

The one signal referred to as being the only one not worked from the 40-lever machine illustrates the operation of the Patenall electro-mechanical slot by which the signal is automatically thrown to danger by passing trains or by the operator at either one of two towers from which the signal is controlled, and which prevents the throwing of the signal to safety without the conjunction of operators from both towers. This signal is controlled from the eight-lever machine on the upper platform. The four-lever machine on the upper platform is fitted with the ordinary Sykes block instruments, while the 12 and eight-lever machines are fitted with Patenall's improved Sykes instruments.

There is also exhibited on the main platform a set of train describers for use in large yards, consisting of one sender and one receiver with fourteen indications; also one signal repeater with blade commutators, one mechanical slot, one route signal with three indications, one two-arm signal, home and distant, one bracket signal post with two arms, one station block signal and relays, miniature track, and signals worked in connection with the eight-lever machine to show the operation of the Sykes block system.

Beneath the platform are shown a low dwarf signal, a compensating pot signal, an ordinary dwarf signal and a Manhattan standard pot signal. Among the machines on the main floor are a four-lever standard dwarf machine, a one-lever dwarf machine controlled by Tyer's train tablet system for outlying switches on single track a one-lever dwarf machine with electric locking, for controlling outlying switches; one distant switch lever, and one old style and one new style four-way selectors.

There are also box cranks, lazy jack compensators, a one-way bridge coupler, with locks complete for drawbridges, and various other appliances. Photographs show interlocking towers at various points, and signal machines and other devices manufactured by the company. Among the photographs is one showing the interior of the tower at Fifty-ninth street and Fourth avenue tunnel, New York, which is equipped with a No. 2 machine, and of which plant an extended description is given in the *Railroad Gazette* of May 26.

**Varying the Interval Between Drinks.**

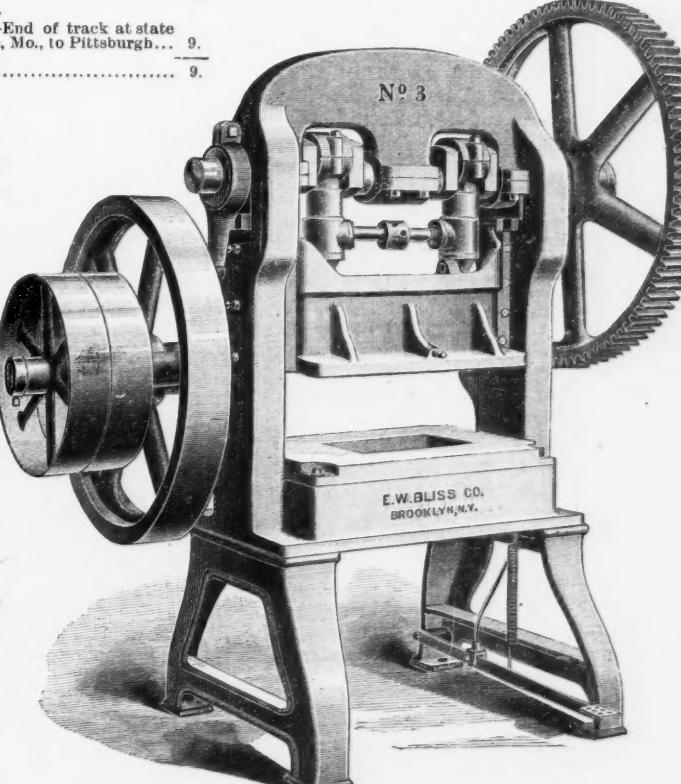
One of the provisions of the South Carolina law establishing a State monopoly in the liquor business forbids any railroad to haul intoxicating liquors into the state consigned to anybody but the State dispensary. It is more than doubtful whether any railroad corporation engaged in interstate commerce can lawfully discriminate against the shippers of this class of merchandise. But if they should undertake to do so, how can they tell what may be contained in the packages? They cannot overhaul and inspect the inside of everything. Moreover, liquor may make its way into South Carolina without being consigned to anybody. It is liable to creep into trunks and travel as personal baggage, or go on the outside of the persons of travelers or in their gripsacks. It is extremely doubtful whether the interval between drinks will be much extended in South Carolina by the new law.—*Exchange.*

## Railroad Building in the First Half of 1893.

We publish in this issue our usual semi-annual statement of track laid, from which it will be seen that the new mileage built in the United States between Jan. 1 and July 1, 1893, was 1,025 miles. The table, which follows, reports the lines on which the new track has been laid, the companies building, and the states in which the new road has been constructed:

NORTHERN STATES EAST OF THE MISSISSIPPI.	
<i>Maine.</i>	
Bangor & Aroostook.—From Brownville, east	5.
Track laid	5.
<i>Massachusetts.</i>	
New York & New England, on Providence & Springfield.—From state line near Pascoag Station, R. I., to East Thompson	1.6
Track laid	1.6
<i>Rhode Island.</i>	
New York & New England, on Providence & Springfield.—From Pascoag Station to a connection with the main line of the New York & New England, near Douglas, Mass.	5.2
Track laid	5.2
<i>New York.</i>	
Catskill & Tannersville.—From Catskill Mtn. Station to Kaaterskill	1.
Long Island, on New York Bay Extension—Hempstead Crossing south to Valley Stream	1.
Niagara Junction.—In the town of Niagara Falls	4.
Rome, Watertown & Ogdensburg, on Gouverneur & Oswegatchie.—Gouverneur Junction east to Edwards	11.
Saranac & Lake Placid.—Saranac Lake west to Lake Placid	10.
Staten Island Rapid Transit.—From Arrochar to South Beach	2.
Track laid	37.
<i>New Jersey.</i>	
Central of New Jersey.—From Atlantic Highlands to Stone Church	2.
Track laid	2.
<i>Pennsylvania.</i>	
Altona & Phillipsburg Connecting.—Osceola northward Phillipsburg	2.
Bloomsburg Belt.—From a point in Bloomsburg to a furnace	1.
Buffalo, Rochester & Pittsburgh, on Clearfield and Mahoning.—On Bois Junction, on B. R. & P., east to a connection with Beech Creek R. R. at Clearfield	26.
Cambria Iron Co.—At Johnstown, Pa.	1.
Cambria Lumber Co.—Near Fosterville, on B. & O. R. R.	5.
Cross Fork.—From Cherry Springs east	4.
Keystone.—Near Gardeau	4.
Kishacoquillas Valley.—Near Alexander's to Reedsville, New York, Ontario & Western.—On a mine branch near Forest City	3.5
Pennsylvania, on Cambria & Clearfield.—On Susquehanna Division to Cherry Tree and the Chest Creek Division to McGee's	23.
Pennsylvania & Northwestern.—On colliery branches, Pittsburgh, Shemango & Lake Erie.—Meadville to Val-Jonnia	1.5
Shade Creek.—From Meyersdale	7.
Tionesta Valley & Hickory.—From Ross Run to Diablo	1.5
Western Maryland.—Near Spring Grove, northeast to town of York	10.6
Wilkes-Barre & Eastern.—Wilkes-Barre to Viaduct, 20 miles; Lehigh River to Pocono Summit, 12 miles; Tantville to Stroudsburg, 3 miles; a total of	35.
Williamsport & North Branch.—From Bernice Junction to Ringdale	4.5
Track laid	135.1
<i>Ohio.</i>	
Columbus Terminal—at Columbus	5.3
Eastern Ohio—Morgan Junction to Campbell's Station	1.
Findlay, Fort Wayne & Western.—Cin., Jack., & Mackinaw R. R., west to the Ohio and Indiana state line	11.5
Ohio Southern, on Lima extension—Springfield north to St. Paris	23.
Track laid	40.8
<i>Indiana.</i>	
Bedford Belt.—In Bedford, to complete belt line	1.
Elkhart & Western.—From Mishawaka toward Elkhart	4.6
Elgin, Joliet & Eastern.—McCool to Porter	4.6
Indianapolis, Logansport & Chicago.—In city of Indianapolis	1.5
Wabash.—From Crocker to Clark Junction, completing the new Chicago-Detroit extension	16.
Track laid	27.1
<i>Illinois.</i>	
Calumet & Blue Island.—At South Chicago	2.
Centralia & Chester.—End of track at Hoyleton northeast to Centralia	11.
St. Louis, Chicago & St. Paul.—From near Bates north to Springfield, 12 miles; and on Alton extension, from Alton south toward Kindar, 5 miles; total of	17.
St. Louis & Eastern.—Near East St. Louis, northwest to Marine	11.8
Track laid	41.8
<i>Wisconsin.</i>	
Chippewa River & Menominee.—Extension of main line	3.
Iola & Northern.—From Scandinavia north to Iola	6.
Track laid	9.
<i>SOUTHERN STATES EAST OF THE MISSISSIPPI.</i>	
<i>Virginia.</i>	
Chesapeake & Ohio, on Buckingham Branch.—End of track south of Arvonia, near Mitchells, to Rosney mines	8.8
Norfolk & Western.—From near Roanoke to Castle Rock mines	3.
Track laid	11.8
<i>West Virginia.</i>	
Beaver Creek.—Along Stony River	1.8
Charleston, Clendenin & Sutton.—From Clay County line up Elk River	5.
Chesapeake & Ohio.—On South side extension along New River	1.
Kanawha & Michigan.—From Malden to Gauley River	32.
Track laid	39.8
<i>North Carolina.</i>	
Aberdeen & Rockfish.—From Aberdeen	3.5
East Carolina Land & Railway Co.—Extension of Wilmington, New Bern & Norfolk from Jacksonville northeast to Pollocksville	23.
Glendale & Gulf Mining & Mfg. Co.—Gulf southwest to Glendale	10.
Raleigh & Western.—West of Egypt	1.
Seaboard Air line, on Carthage R. R.—From Carthage to Curriersville	11.
Track laid	48.5

Georgia.	
Boston & Albany.—End of track laid in 1892 at Dot, north to Moultrie, 8.5 miles; Shelby Junction west, 1.5 miles; a total of	10.
Florida Central & Peninsula.—On Savannah extension, from Savannah south	6.
Middle Georgia & Atlantic.—Machen northwest to Bear Creek, near Covington	16.
Ocnee & Western.—Rocky Creek to Dublin	8.5
Track laid	40.5
Florida.	
Atlantic, Suwannee River & Gulf.—Starke to Sampson City	6.5
Florida Central & Peninsula, on Florida Northern (Savannah extension).—Hart's Road, near Jacksonville, north to St. Mary's River	10.
Jacksonville, Mayport & Pablo.—From Arlington to South Jacksonville	4.5
Jacksonville, St. Augustine & Indian River.—End of track laid in 1892 at Coquina south along Indian River to Melbourne	22.
Piedmont.—Piedmont to Alachua	1.
Savannah, Florida & Western, on South Florida.—From High Springs south 10 miles; and from Juliette north 9.5 miles; a total of	19.5
Track laid	63.5
Alabama.	
Gulf Red Cedar Co.—Greenville west toward Alabama River	12.
Track laid	12.
Mississippi.	
Champion Lumber Co.—Near Spring Hill	1.
Track laid	1.
Tennessee.	
Harriman Coal & Iron.—De Armond Station, north of Nashville, Chattanooga & St. Louis.—Pikeville to Tip Top	2.
Nashville & Knoxville.—From Chimney Springs east	3.
Track laid	12.
Kentucky.	
Jellico, Bird Eye & Northern.—Jellico (state line) to coal mines at Halsey, Whitley County	8.
Owensboro, Falls of Rough & Green River.—Between Adams Fork and Rough Creek, to complete line between Horse Branch and Fordsville	6.
West Virginia, Pineville & Tennessee.—Truxton to Taylor's	1.
Winchester & Beattyville.—Branch to coal mines near Beattyville	1.
Track laid	16.
SOUTHWESTERN STATES.	
Louisiana.	
Sibley, Lake Bastineau & Southern.—Yellow Pine to Bluff City	2.3
Track laid	2.3
Arkansas.	
Missouri Pacific, on Little Rock & Fort Smith.—From Coal Hill to coal mine	5.
Southwest Arkansas & Indian Territory.—From Hebron east	2.
Stuttgart & Arkansas River.—From Darel south toward Gillett	3.
Track laid	10.
Missouri.	
Kansas City, Pittsburgh & Gulf.—Hume south to state line, on branch to Pittsburgh, Kan.	21.
Missouri, Kansas & Texas, on Missouri, Kansas & Eastern.—Along Missouri River from North Jefferson west to New Franklin, to complete the line into St. Louis, 45 miles; also between St. Charles and Texas Junction, 12 miles, on eastern end of same extension, a total of	57.
Missouri Southern.—Aquilla to Caxas	2.5
St. Clair, Madison & St. Louis Bell.—From Bellefontaine Junction east	2.
St. Louis, Keokuk & Northwestern.—Portage des Sioux to Bellefontaine Junction and to St. Louis city limits	19.7
Track laid	162.2
Kansas.	
Kansas City, Pittsburgh & Gulf.—End of track at state line, on branch south from Hume, Mo., to Pittsburgh	9.
Track laid	9.
Colorado.	
Crystal River.—Carbondale to Hot Springs	12.
Union Pacific, Denver & Gulf.—Near Louisville to Allen Bond Mine	3.4
Track laid	15.4
New Mexico.	
Union Pacific, Denver & Gulf.—Extension of Red River branch	2.
Track laid	2.
Arizona.	
Santa Fe, Prescott & Phoenix.—From end of track laid in 1892 south of Ash Fork to Prescott	41.
Track laid	41.
NORTHWESTERN STATES.	
Nebraska.	
Chicago, Rock Island & Pacific.—Completing extension from Lincoln southwest to Jansen, on which 30 miles of track were laid in 1892	22.
Track laid	22.
Minnesota.	
Duluth & Iron Range.—From McKinley in the Mesaba Iron Range westward	6.3
Duluth, Mesaba & Northern.—From near Stony Brook Junction to Duluth, about 24 miles, track laid for	12.
Duluth Transfer.—In the city of Duluth	1.
Track laid	19.
North Dakota.	
Minneapolis, St. Paul & Sault Ste. Marie.—On Northwestern extension from end of track, near Cathay northwest to a point beyond Sheyenne River	56.
Track laid	56.
Wyoming.	
Burlington & Missouri River.—On Northern Wyoming extension, from end of track west of Sheridan north to Tongue River	4.
Track laid	4.
Idaho.	
Boise City Railway & Terminal Co.—New terminal for the Union Pacific system into Boise City	3.
Track laid	3.
PACIFIC STATES.	
California.	
Alameda County Terminal.—Fruit Vale to Alameda	3.
Nevada Southern.—Blake Station, on Atlantic & Pacific, north to mines near Purdy	30.
Track laid	33.
Oregon.	
Coos Bay, Roseburg & Eastern.—End of track at Cedar Point south to Coquille City	3.
Track laid	3.
Washington.	
Everett & Monte Cristo.—From crossing of Stillaguamish River, east of Hartford, east to Silverton	20.
Nelson & Fort Sheppard.—Building an extension of the Spokane Falls & Northern from Northport north to International boundary line	9.5
Track laid	29.5
CANADA.	
New Brunswick.	
Tobique Valley.—Wapskehegan River to Plaster Rock	2.
Track laid	2.
Texas.	
Chicago, Rock Island & Texas.—From Bowie south to Fort Worth	70.5
Denison & Wichita Valley.—Branch from near Denison to Warner, on the M. K. & T.	3.
Missouri, Kansas & Texas.—End of track laid in 1892, at Brazos River, east to Houston	41.4
Texarkana & Fort Smith.—Texarkana southward	1.
Texas, Louisiana & Eastern.—From Cleveland Station east	6.
Texas, Sabine Valley & Northwestern.—From Carthage to end of track	2.
Track laid	123.9
Ontario.	
Grand Trunk—Glencoe north to Kingscourt, making junction with Sarnia line	22.
Lake Erie & Detroit River.—End of track at Merlin west to Ridgeway	22.
Track laid	44.
Quebec.	
Baie des Chaleurs.—New Richmond, the former eastern terminus, east to Capleau	10.
Quebec & Lake St. John.—From end of track east of Chambord toward Chicoutimi	21.
Track laid	31.
The Bliss, No. 3, Double Crank Press.	
We show an engraving of a double crank press made by the E. W. Bliss Co., showing new designs of the frame (which has also been considerably strengthened) and a new method of connecting the two pitmans so as to enable the operator to quickly raise and lower the slide without danger of getting the pitmans out of alignment with each other and with the guides.	
This press is largely used in the manufacture of railroad goods, coal hods, vapor stoves, wrought iron ranges, paneled ceiling and siding, cornice work, etc. It is specially adapted for operating large cutting, forming, perforating and bending dies. It can also be made without gearing and with overhanging frame instead of	



The Bliss Double Crank Press.

the straight uprights shown. Its principal dimensions are 36 in. between the uprights, die space (up and down) 10 in., 2 in. adjustment, height 90 in., weight 5,500 lbs. The company also makes similar presses in other sizes up to 50,000 lbs. in weight.



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#### EDITORIAL ANNOUNCEMENTS

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The subject of yard limits and the way to get the most benefit from the use of yard limit boards is discussed in a contribution printed in another part of this paper. This letter sets forth a state of facts which we have referred to before, and we publish it not only because it gives a scrap of actual experience, but because this is a kind of experience which may be found on a good many roads. Not every superintendent issues orders which are ambiguous and confusing, but a good many do endeavor to divide the responsibility in the way indicated by our correspondent. We have often sermonized on the general carelessness in language which may be seen in railroad regulations, but it is to be observed that that is not the difficulty here. Many roads make a well-phrased order for trains to approach yards carefully, and then make another, in equally clear terms, telling the trains within the yards that the first-mentioned order does not protect them. Others content themselves with "this does not relieve you from protecting yourself, while in a yard, whenever necessary," the last two words throwing upon the conductor the whole responsibility of deciding when to flag, and thus introducing as great a variety of practice as there is of mental habit in the conductors. The remedy for this general weakness in our practice is very simple, and has been employed by the New York, Lake Erie & Western for several years. On that road the time tables contain the following explicit declarations:

*"It will not be necessary for any engine or train occupying the main tracks inside of established yard limits to be protected by flagmen, except when in the time of a first-class train. All trains must be governed accordingly."*

These 39 words will obviate the necessity of a number of complex paragraphs and amendments to the flagging rules, and clear up more than 39 doubts in trainmen's minds, provided "established yard limits" are prescribed at all stations where necessary. On the Erie this is not done at many places other than those employing a switching engine constantly. In view of the numerous legitimate difficulties surrounding the whole matter of flagging, not to mention the dullness and the cussedness frequently found in brakemen, it is a pertinent question whether yard limits, to make flagging unnecessary, ought not to be established at numerous smaller stations on a good many roads. Where a station is so located that heavy freight trains can approach it under control without waste of time or of coal why should they not do so?

If there is any one defect in the workings of the Master Mechanics' and Master Car Builders' Associations that is emphasized year after year and seems to get worse rather than better, it is the failure of members to answer circulars. In not a single instance this year was a report presented that contained expressions from a majority of the members of the Association, and in two instances conclusions were drawn from a very limited representation. It is a question whether

it is better to draw conclusions from so few replies or to refuse to report because of lack of information. Every year the President, directly or indirectly, calls the attention of the members to this matter, but no effect seems to have been produced on the members individually. Probably the best way to bring attention to the delinquents would be to publish the names, in the annual report, of those members who do not reply to circulars. As it is, only the names of those who do reply are given. The work of the Associations is very important; it needs no argument to show this; the records are sufficient proof, and being useful, this delinquency on the part of members is worth the attention of the higher officers of railroad companies. If the presidents and general managers could be induced to stir up the master mechanics and master car builders, the results would more than pay for the time and trouble. One would suppose that men in charge of the mechanical departments would dislike to have their superior officers know that they are not doing their duty by the Associations; but such is apparently not the case. It requires but a small percentage of the working hours in a year to answer fully and completely the comparatively small number of questions issued by the several committees, and it can hardly be claimed that lack of time is the main reason for failing to make replies. It is more than likely that the failure results from putting off from day to day all matters that do not require immediate attention. This goes on until it is too late to make replies and the Association convenes with the work about half completed. Members generally feel that each individual of a committee should either be willing to give his attention to the work allotted to him or resign immediately so as to give his successor time to do the work; and it is equally necessary that each member should reply to circulars as soon as possible and assist the committees in every way. It is noticeable at the conventions that some of the members who do not answer circulars are very free to speak on the floor, and in some cases one wonders why the remarks on the floor were not put into replies to the circulars. Mr. John Hickey, the President of the Master Mechanics' Association, has determined this year that the members of that Association shall answer inquiries if it is possible to get them to do so, and those who do not make replies this year will have no good excuse, as the circulars will be followed up by a personal request. The officer who accepts a position in the Association also accepts considerable responsibility for the work of the committees, and probably no more useful work can be done than to keep run of the work and urge the delinquent members to do their duty.

#### Some of the New Railroads.

The record of new railroad built the first half of this year shows an aggregate of 1,025 miles, 260 miles less than we recorded for the same period last year. The 4,150 miles recorded for the whole of 1892 seemed very small to those who looked for a return of the conditions of five years ago, but the causes were well known, and it is needless to state that similar causes have continued down to the present time.

As in 1892, so now, the bulk of the new mileage consists of short lines, generally built to meet well-defined needs, to develop mineral and other natural resources, or to feed old lines. In a brief review, printed on Feb. 10, last, of the new railroad built in the year 1892, we found only a dozen companies which had laid more than 50 miles of track each; and the record of the first half of 1893 shows even fewer lines that are prominent enough to attract general notice, scarcely a dozen having laid more than 25 miles each.

The two companies that come first on the list, the Chicago, Rock Island & Pacific and the Missouri, Kansas & Texas, have each been engaged chiefly on the completion of the extensions that were spoken of in the February article referred to. The former has laid 70 miles on its Texas extension this year and has now reached Fort Worth. The largest through business expected for this line is in carrying grain from Kansas to Texas for export at Galveston, which, though not yet a stable traffic, has been of considerable consequence on the Atchison, Topeka & Santa Fe this year. The transportation of cattle from Texas northward is also profitable at certain seasons. The extension has certain other features which may give it a traffic even more valuable than the through business. The Rock Island's line down through the Indian Territory and Oklahoma and into Northern Texas passes through a valuable country and one that is pretty sure to fill up rapidly with settlers. The extension to Fort Worth places that part of this country which is on the line of the Rock Island in close communication with the most important markets and distributing centers of the Southwest, and it may easily be that the local

and non-competitive traffic of the new line will soon develop into its most important business.

The Missouri, Kansas & Texas (with the Missouri, Kansas & Eastern, its St. Louis extension) has now nearly completed its system, as outlined last year, 97 miles having been built in 1893. The Texas lines are in use already, and trains will probably be run to St. Louis within a few days.

The Minneapolis, St. Paul & Sault Ste. Marie is also one of the lines which appear in both last year's list and this year's. The extension northwestward to connect Minneapolis with the Canadian Pacific, on which 56 miles of track has been laid this year, now becomes of special importance to the Canadian Pacific (which controls the "Soo" line), because the Great Northern, having finished its own line to the Pacific coast, refuses longer to pro-rate with the Canadian line; and it is given out that this extension, on which there is 75 or 100 miles more to be built, will be rushed to completion within two months. It is said that when this road is finished the Canadian Pacific will run its transcontinental passenger trains over it. This will doubtless be good for the through traffic and for the cities of St. Paul and Minneapolis, but it is safe to say that Winnipeg will enter a very loud protest. Such a change would divert traffic from a section of the main line of the Canadian Pacific 1,338 miles long (from Regina to Sudbury). The line via St. Paul will be only a trifle shorter than this.

The half-dozen other lines exceeding 25 miles in length may be glanced at in geographical order.

The Wilkes-Barre & Eastern (35 miles laid) is an extension of the New York, Susquehanna & Western from Stroudsburg, Pa., northwestward 70 miles to Wilkes-Barre, to give the latter company a line of its own to the anthracite coal fields. The Susquehanna people are also making a tunnel through the Palisades, north of Weehawken, N.J., to reach the Hudson River, and provide themselves with a tide-water terminal independent of the Pennsylvania, so that it is evident that their plan for increasing their coal traffic is a comprehensive one.

The Buffalo, Rochester & Pittsburgh has built the 26-mile road from its main line eastward to Clearfield for the purpose of sending bituminous coal over the Beech Creek and the Philadelphia & Reading to Eastern points and tidewater from the mines on its own road. The opening of this line will mark the first entrance of the B., R. & P. coal operators into Eastern markets, and it will materially improve their position as competitors in the general coal trade; and as the Reading is a good ally in selling coal and as it has no bituminous mines on its own lines, the prospects of this new road would seem to be favorable.

The 31 miles built by the Kanawha & Michigan is to make a good rail connection with the Chesapeake & Ohio and thus gain access to the numerous coal mines on the line of the latter road. The Kanawha & Michigan is a part of the Toledo & Ohio Central, and thereby is constituted a direct line to Lake Erie, whence it hopes to carry large quantities of West Virginia coal.

The South Florida's 20 miles is part of a 100-mile line being built to connect the Savannah, Florida & Western's main system at High Springs with its South Florida lines at Pemberton Ferry. Besides this use it also runs through valuable phosphate beds and will doubtless have a good traffic in carrying phosphate. Although this new line will join the two detached parts of the Plant system, it will not be used for the through passenger business to and from Port Tampa which, as now, will go by way of Jacksonville and the Jacksonville, Tampa & Key West road. A line of the Silver Springs, Ocala & Gulf forms a part of the new connection, and the whole of that road has been bought by the Plant interests.

Another Florida line of considerable interest is the Jacksonville, St. Augustine & Indian River, which, although only 22 miles of track has been laid this year, is one of the longest lines now under construction. The whole line of the road is now 177 miles long, from Jacksonville south along the east coast to Rockledge, and it is intended to build through to Lake Worth, 300 miles from Jacksonville. From Daytona, 112 miles south of Jacksonville, the road lies close to the coast all the way. This region is the most attractive part of Florida and the chief object in building the road, apparently, is to accommodate pleasure travel. In freight there is water competition at all important points, but the men at the head of the company seem to have an ample supply not only of confidence, but of capital as well.

The Kansas City, Pittsburgh & Gulf, extending southward from Kansas City 155 miles to Joplin, Mo., and completed to within 25 miles of the latter place, is part of a line projected to connect Kansas City and

Texarkana, Tex., in a pretty direct line. The same company controls a road already running from Joplin south to Sulphur Springs, Ark., 51 miles, and appears to have the means to carry out its plans. It is controlled largely by Philadelphia capitalists, who say that they have not yet found it necessary to issue any bonds. The most immediate profit expected from building this road is in the lumber traffic, the Southern portion of the line running through rich timber lands.

The Santa Fe, Prescott & Phoenix, which has laid 41 miles of track this year, is a company which expects to connect the Atchison line at Ash Fork, Ariz., with the Southern Pacific at Maricopa, 150 miles directly south. The new road runs within about five miles of the Vulture mines, which have hitherto been very profitable, even when the ores had to be hauled long distances.

The Everett & Monte Cristo has built 30 miles this year toward the silver and gold mines at Monte Cristo, Wash., which are owned by the Colby-Hoyt syndicate of New York. This syndicate is building the railroad and is developing the town of Everett, on Puget Sound, the western terminus of the line. The mines at Monte Cristo are already producing, and a great quantity of ore is ready to be shipped to the reduction works at Everett as soon as the last 10 miles of railroad into Monte Cristo is finished. The timber traffic from the forests along the Stillaguamish River will also be an important item of business. The cost of constructing the railroad has been over \$1,800,000.

The Nevada Southern, 30 miles long, located in San Bernardino County, Cal., also reaches silver and gold mines, giving them an outlet to the Atlantic and Pacific road.

We have described above all the more important new lines built this year. Few who follow the course of railroad construction in this country will criticize the wisdom of building these extensions. Most of them meet the real needs of the territory through which they are built, and they will probably have a paying traffic from the first, and the few other lines, which reach sections now provided with ample railroad facilities, and cannot be supported from local traffic for some time, are justified by their importance to the parent road in securing valuable connections enabling it to reach important cities.

#### Screens and Strainers for Airbrake Pipes.

The very interesting report of committee on Airbrake Tests presented at the Lakewood convention and the remarks of Mr. Godfrey W. Rhodes regarding the condition of train-pipe screens, while important did not excite as much discussion as would have been the case had it not been for the interruption of the meeting. What Mr. Rhodes said was practically that the average railroad inspector does not understand the usefulness of screens, and therefore they are badly neglected even to the extent of rendering airbrakes inefficient and in some cases inoperative.

Long experience has shown that it is necessary to put a screen in the pipe leading from the train pipe to the triple valve, and also to put one at the triple valve itself. The Westinghouse Airbrake Company has used these screens for a long time. One, of cylindrical form, is placed in the large tee in the train pipe where the pipe connection leads out to the triple; the other, of cup form, is placed at the triple itself where the connection is made with the piping. The cylindrical screen is arranged so that air passing along the train pipe goes directly through without being screened, but air passing to the triple goes through the screen. In this way there is no obstruction to the movement of the air in the train pipe, and practically no obstruction to the small amount of air going through the triple when the screen is in reasonably good order. A screen placed across the train pipe at each car will seriously hamper the action of the brakes, and should not be permitted. These are the general results of experience, and whatever devices are introduced in the way of screens should not obstruct the passage of air more than the devices just described.

Of course, there may be many modifications of this arrangement of screens, but in no case should the movement of air along the train pipe be obstructed. To put a screen across the train pipe results in collecting the dirt that would otherwise be blown through to the end of the car and out at the back end. It is clear that in wet weather, when moisture is liable to get into the hose couplings, if the moisture and dirt be blown together through the train pipe it will collect on a transverse screen and give trouble. Such screens have been put in and have caused brakes to become inoperative, even to the extent of failing completely when needed for a rapid service application or for an emergency.

The point to which Mr. Rhodes called attention particularly is the fact that some makers of brake devices

are neglecting this important matter of screens, and are either leaving them out entirely or are putting in a transverse screen. It is, of course, better to leave them out than to put a screen across the train pipe; but to leave them out is to get into serious difficulty finally, and every railroad officer having charge of car inspectors should promulgate instructions to the effect that cars when inspected should be examined to see if screens are properly located and if they are clean. It is a comparatively simple matter to do this, and a car is certainly in bad order if the screens are out of place, improperly located, or filled with dirt.

It is rather surprising that more attention has not been paid to this matter before, and it is but justice to the Westinghouse company to say that it has given much care to this detail, and has always furnished the proper screens with its apparatus. Probably the neglect of this matter up to this time on the part of some brake companies and railroads has resulted from the large amount of attention they have had to devote to other details of brake mechanism. The development of new systems of airbrakes to certain and exact operation even when in good order, is a problem of sufficient magnitude to occupy the best attention of all concerned, and this may be why the screen matter has been neglected.

Brake mechanism differs from every other device used in railroad equipment in one important particular. It is a delicate apparatus which works better in practical service than one would expect from an examination of the number of details and the complicated function of the parts. Defective screens, a slight variation in the size of the openings, or rough and careless workmanship, makes a triple valve very much less efficient, and it is dangerous to treat brake mechanisms lightly. The best is none too good, and it is the realization of this that has led the Master Car Builders' Association to appoint a committee to fix upon a standard of action of brake devices.

One important fact that has developed since the committee took hold, and which has sent over the report on the proposed standard tests to another year, is the discovery by the committee that some of the brake mechanisms that will approximate in operation to the first proposed standard on a 50-car train are wholly inadequate for a 100-car train. It has been found that some brakes that will apply with quick action on 50 cars will act slowly on 100 cars, and that in a service application some devices will apply with considerable force at the front end and not apply at the back end of a 75-car train. Of course, no one is running 75 or 100-car trains; but the tendency is toward longer trains on level roads, and it is a matter for serious consideration whether it is worth while to purchase brakes for 50-car trains when it is possible that before the cars are removed from service longer trains than 50 cars will be commonly used.

The general use of airbrakes and automatic couplers will reduce materially the number of men required per train, as has been found on roads such as the Northern Pacific, which has already equipped about 80 per cent. of its cars with automatic brakes; and as the important factor of the cost of wages per ton mile is very materially reduced by the practice of running long trains, it is not safe in these times of rapid development to say that a 50-car train is the ultimate length. Few railroad men would be willing to say that a 75-car train is impracticable to run on comparatively level roads, and fewer still would care to prophesy that such trains will not be run in the next 20 years. The brake mechanism, as it now stands, is pretty well developed, and it is doubtful if any material improvement will be made for some time to come, and the best devices now being put into use will approximate very closely to what will be used, say, 20 years from now; therefore, we may expect that as the life of a brake mechanism is much greater than that of the ordinary wooden car, the time will come soon when the brake mechanisms of cars that are worn out and discarded will be removed, repaired, and put on new equipment. Surely, the limit to the time of use of brake mechanism should be dependent upon its own life and not upon the life of the car, and those who are purchasing brakes in large numbers should bear in mind the fact that they are buying brakes not for immediate use, but for the next 25 or 30 years, and perhaps longer. This would lead to the logical conclusion that the best mechanisms are none too good, and that whatever is purchased should not only be subject to a severe examination, according to the best light obtainable, but should also be applied to equipment with all possible care in order that its life may be dependent upon natural wear and not upon the method of application. The great enemy to a long life for a triple valve is grit, and keeping out the grit requires

the use of good screens properly placed, and this is the

matter to which Mr. Rhodes has called attention and which is worthy of consideration by railroad officers who have charge of the inspection of equipment.

#### Electric Motors for Steam Roads—A Step in Progress.

In another column will be found illustrations and a general description of the heaviest electric locomotive that has been built. It is, however, not as heavy as those for the Belt Line tunnel of the Baltimore & Ohio Railroad that are now being built at Schenectady. As is said in the description, this electric locomotive has been designed for elevated railroads, for switching, and for light passenger and freight traffic on the smaller steam roads. It has the same hauling capacity as a 30-ton switcher without trucks; about twice the hauling capacity of a Manhattan Elevated engine, and 50 per cent. more than those on the Chicago elevated. It is, in fact, the first substantial attempt to put an electric locomotive in the same service as a steam locomotive. It may not be out of place here to review somewhat the problems presented in this work; but before doing so perhaps some additional description of this machine may be desirable.

The armature is not unlike a large drum. It consists of a very great number of thin, soft iron plates about one-fiftieth of an inch in thickness, stamped in a die, with a large hole in the centre for the shaft and with slots or grooves suitable for the conductors. The term "conductor" is here used instead of "winding" to emphasize the fact that armatures for electric motors and dynamos of large size are no longer wound with wire as formerly, but have instead copper bars of considerable section which are inserted in insulated grooves running lengthwise of the armature. The ends of the bars are securely connected to the commutator by rather heavy, flat, copper strips covered with the best insulation. The plates of the armature are separated by thin sheets of tissue paper for the purpose of insulating each plate from every other. This prevents cross currents, more properly called Foucault currents, which if not prevented will cause the armature to heat. Thus the armature is a drum made up of thin sheets of iron, insulated from each other, and all clamped together upon a hollow sleeve. The hollow sleeve is incidental to the peculiar construction of the motor in question, and it is not used on all motors, and never used on motors that have a geared connection to the axle. It follows from the plan of connection between the armature and the driving axle that has been adopted by the General Electric Company for the large motors.

In the minds of some this hollow sleeve is a necessity, for the following reasons: An efficient practical motor must run without sparking; that is, without flashing at the commutators, and the armature must revolve as close to the field magnet pole pieces as possible without touching. This requires that the armature be made and kept central between the pole pieces, and that the distance from the pole pieces be not more than  $\frac{1}{16}$  to  $\frac{1}{16}$  of an inch. The wear of the bearings alone would very quickly make the armature out of centre so that it would strike the pole pieces and by being out of centre cause sparking, unless large, adjustable bearings are used. It is clear from this that the bearings for the armature shaft must be rigidly attached to the frame holding the pole pieces, and thus if the armature was placed directly on the axle the motor frame, pole pieces and field magnets would also have to be attached and carried directly on the axles. Now, as most of the weight of an electric locomotive is made up of the weight of the motor itself, including the armature, pole pieces and field magnets, the whole weight of these heavy parts would be on the axle directly, without any flexible springs or parts intervening. This would be an impracticable construction for large motors, as the driving wheels must be comparatively free to move and accommodate themselves to the unevenness of the track. To give flexibility, the armature is mounted on a hollow sleeve surrounding the driving axle and bored out about  $2\frac{1}{2}$  in. larger in diameter. This permits the axle to move vertically about  $1\frac{1}{2}$  inches without striking the sleeve or requiring any movement of the motor itself. The bearings of the hollow sleeve are securely and rigidly attached to the field magnets and pole pieces and are supported not on the axle, but on the frame of the locomotive between which and the axle boxes are comparatively flexible springs. So far as designed, none of the direct connected motors, so called, are provided with such flexible springs as are used for steam locomotives, and therefore the platforms on which the runners stand have additional springs to make the machine ride easily. On geared motors it is practicable to give more vertical flexibility than on direct-connected motors.

A direct connection means that each revolution of

the armature causes a simultaneous and corresponding revolution of the driving wheel, whereas with geared motors the armature may revolve several times for each revolution of the drivers. The connection between the hollow sleeve and the driving wheel in the electric locomotive in question is made by means of a Greek cross clutch which permits a free movement of the driving wheel. In this way the heavy mass of the motor itself is carried on flexible supports, and yet there is, in effect, a positive connection between the armature and driving wheel.

A *series parallel controller* is pretty nearly as complicated, or rather complex, in its functions and construction as its formidable name would indicate. It has been called the "thinking apparatus" of an electric motor. Its object is to enable the motor to be started with greater efficiency and with less jerking than could be done by the use of a simple switch to make and break the circuit. Besides this, it is practically impossible to break a circuit carrying such heavy currents as are used in railroad work without doing serious injury to the apparatus from the electric arc which follows the separation of two conductors bearing a heavy current. The separation has to be made gradually, and by first reducing the amount of the current. The series parallel controller is in reality a collection of switches arranged on a drum of considerable size. For this machine it is about 24 inches in diameter. These switches are formed of strips of brass or copper, fastened on the body of the drum which is a non conductor and acts as an insulator between the strips. Different sets of contacts slide over these brass strips in such a way that the resistance boxes and the several motors are connected up in series or in multiple (parallel), as the case may require. "Series" applies to the condition when the connection is made so that the current passes through the motors and resistance boxes in tandem, that is, so that all the current passes through each. "Multiple" or parallel means that the current is divided and part of it passes through each. It is not unlike a system of parallel water-pipe connection where the water is made to flow through the whole length of pipe, one piece after the other in series, or is allowed to pass through by sub-dividing, a part going in parallel through each pipe, and joining together again in the main beyond. Manifestly, the series condition would give greater assistance either to the water or the electric current than the multiple or parallel condition. The less the resistance the more the flow of current; hence, the parallel is used to get more current through by reducing the resistance. When an electric motor is standing still its resistance to the passage of current is very small, and an external resistance has to be introduced to prevent more current flowing into the motor than it can stand without burning out or excessive heating. This resistance, termed a "rheostat," is made up of thin plates of iron partially insulated from each other, such as is commonly used in street-car work.

When a motor is being driven by an electric current, its direction of motion is such that if it were driven by a steam engine it would generate a current moving in the opposite direction to the current which drives it as a motor. A motor is nothing but a dynamo, reversed in direction of motion with respect to the current. This constant tendency of motors, when moving, to generate a current in the opposite direction is called the counter-electromotive force. This backs down the incoming current and acts as a safeguard to prevent the motor being burned out. If a motor be held so that it cannot revolve it might be burned out in 15 or 20 seconds, but if allowed to revolve freely it will back down the main current, and burning out is impossible. Therefore, it is clear that resistance has to be introduced when motors are started from a standstill in order to back down the main current and prevent injury.

It is, then, to prevent injury to the motors and to prevent sudden jerks in starting that the motors themselves are put in series with one another and in series with resistance boxes at starting. They are put in multiple when the motor is running rapidly in order to reduce the resistance, which is then augmented by the counter-electromotor force, so as to allow more current to go through the motor and increase the turning power on the axles. Further, it is more economical to reduce the current used at starting for the reason that however much current may go through the motor, if the motor does not move, no useful work will be performed, and the efficiency will be zero, and the loss greater than if the start is made with less current. In order to give the same starting power with less current, the windings on the field magnets are frequently sub divided and each sub-division is connected to the series parallel controller, so that the sub-

division of the field magnets may be put in series or parallel as required.

The strips on the controller are arranged so that one connection is made before another is broken, and in this way the steps taken in increase and decrease of current are comparatively small and all arcing or flashing of the contacts on the controller is practically avoided.

The series parallel controller then is, in simple language, a rather complicated collection of switches, not unlike a music box, which permits the motors to be started steadily without damage to the different parts and without serious loss in efficiency. The controller is only used in regular practical service in stopping and starting; that is, so far as the resistance boxes are concerned. Manifestly it is uneconomical to waste heat in the resistance boxes, and therefore these are thrown out of circuit as soon as the motor has attained some considerable speed. After that the controller changes the motors from series to parallel as may be needed. As a rule, the complete parallel connection is used for high speed and the complete series connection for low speed.

The electric air pump mentioned in the description is made up of an electric motor, driven from the main circuit, on the shaft of which is a crank to which is connected directly the piston rod of a small oscillating engine type of air pump. The air cylinder oscillates like an oscillating hoisting engine, and pumps the air in the same way as an ordinary air pump.

Taken all together, this locomotive is one of the most interesting machines that has been brought out for a long time. It has cost a large sum of money, as it has been developed slowly. It is unique in appearance, and is sure to take a prominent place in the history of the development of the use of the electric current as a substitute for steam in driving railroad motors. It has been tried in competition with a steam, switching engine of equal weight, and it was a surprise to the steam locomotive engineer to find that an electric locomotive could pull his engine backward against her own steam pistons with the throttle wide open. The reason is clear when explained. It is that the steam locomotive, while having equal adhesion, cannot utilize the total adhesion during the entire revolution of the drivers owing to the fact that the turning moment produced by the steam pistons varies fully 25 per cent. at different points of a revolution, and the maximum turning power cannot exceed the adhesion of the drivers. This leaves the minimum 25 per cent. below the adhesion of the drivers, whereas the electric locomotive has a constant turning power and the minimum is therefore greater than the minimum of the locomotive, with the natural result that the electric locomotive can pull the steam engine backward when there is equal weight on the drivers of both. This illustrates one advantage of electric locomotives.

What the efficiency of this locomotive will be in regular work it is impossible to prophesy, but in switching service where the use of power is intermittent, the electric locomotive has a decided advantage, as no power is consumed when the motor is not running, while in the steam locomotive the coal, which represents power, is being consumed in the firebox without doing useful work, and heat is continually being lost from the boiler by radiation.

In elevated railroad work the electric locomotive would have somewhat less advantage during working hours than in switching service, but during the ten to fourteen hours per day, when the elevated steam engine is lying idle, it is consuming fuel, particularly in the winter season, while electric locomotives are causing no loss. Again, there are no parts to freeze up in cold weather with the electric motor, and very little oil is required.

It is not to be expected that the type of motor shown in the illustrations is the kind that will be eventually used for elevated railroad service, one reason being that there is only one elevated railroad structure, the Metropolitan in Chicago, that would safely carry such a motor as the one described. The weight is greater than the total of any elevated engine in use and is concentrated on a short wheel base.

The weight of this motor is all non-paying weight, which it would not be if the motor was adapted for carrying passengers. From a careful analysis of the situation we have been led to the conclusion that the most economical type of electric motor for elevated railroads, considering repairs, total train weight, strain on the structure, carrying capacity and other important features, is one having seats for 30 to 50 passengers and carried upon two, 4-wheel, swiveling, motor trucks and arranged to run in both directions. The adhesion of such a motor would be increased by the passengers carried and the strain on the structure would be considerably less than that now produced by the steam

locomotives used, while the hauling capacity would be fully double that now obtained. This would render eight-car trains perfectly practicable on an elevated road.

We cannot enter here into the theoretical economy of such a locomotive as we have proposed, as space will not permit, but those who care to do so may take, as a perfectly safe basis, the efficiency of the electric locomotive at 50 per cent., reckoning from the current in the main conductor. The cost of producing the current up to the point where it is taken into the motor can be estimated within less than 5 per cent. error by following any of the well established methods for estimating the cost of electric power in the form of current. It may be well to say here that so long as anthracite fuel is used for elevated roads all careful estimates made on a conservative basis will show a considerable saving for the electric locomotive. The question of repairs is an unknown factor, but, based on the experience of the Intramural road in Chicago, at the World's Fair grounds, the repair account would be very much less with the electric than with the steam locomotive, besides having the advantage of less complication and requiring much less attention while in service. Of course, to a careful mind, conviction in this matter will only come from actual service, and it is this which the Intramural road, built by the General Electric Company, is expected to settle. To civil and mechanical engineers, as well as to railroad men, the Intramural road will probably prove to be one of the most interesting exhibits at the World's Fair, standing as it does as a representation of the nearest approach to the substitution of the electric for the steam locomotive in actual daily work. A careful record is being kept of the work done on this road and the results will be published.

At a meeting of the Trunk Line Association in New York on Wednesday, an agreement was arrived at for excursion trains and rates from New York to Chicago during the World's Fair. The meeting was very fully attended. Besides the officers representing the railroads Messrs. Walker, Goddard and Farmer were present. Mr. Fowler, of the New York, Ontario & Western, has opposed the plan for reasons that he gave in a letter to the Association. He says that in a two weeks' sojourn at Chicago he was unable to discover any dissatisfaction on the part of the public with the rates in force, and while the managers of the World's Fair and the ticket scalpers would be glad to see passenger rates completely demolished, he doubts whether the share owners and creditors would take that view of such a situation. He is convinced that the proposed reduction is a mistake and will create another of those unfortunate precedents which tend to the permanent reduction of rates already too low, and which tend to make the question of net profits still more uncertain. Granting the great educational value of the exhibition he does not precisely see the duty of the railroads alone to make sacrifices to put that means of education within the reach of the people. Mr. Fowler, however, withdrew his opposition when he found that he stood practically alone and the measure was adopted unanimously. The plan is for special trains, composed of day coaches only, to run in not less than 30 hours, with no stop over privileges, the return limit to be 10 days. The rate is to be a single fare for the round trip, and for children between five and twelve years 75 per cent. of the one-way rate. This makes the round-trip ticket \$20 on the New York Central and Pennsylvania, and \$17 and \$18 on the roads having differentials. Two excursion trains will be run on each Monday, Tuesday, Wednesday and Saturday, and Commissioner Farmer has announced the arrangement of trains beginning with July 24 up to Aug. 19. The first trains will be by the Erie and the Baltimore & Ohio on July 24. These will be followed on July 25 by trains on the New York, Ontario & Western and the Pennsylvania, and so on.

The July returns to the Statistician of the United States Department of Agriculture make the average condition of corn 93.2, winter wheat 77.7, spring wheat 74.1 and oats 88.8. The acreage of corn is reported as 3.3 per cent. above last year, being an increase of something over 2,000,000 acres. The greatest increase is in Nebraska; after that Kansas, Iowa, Illinois, Missouri, and Indiana. The average condition of corn is 93.2, against 81.1 last July, and it is high in all the great corn states. Of course it is early yet to predict much about the corn crop, in spite of the large acreage and the present high condition. The winter wheat condition is 77.7, against 75.5 last month and against 89.6 in July of 1892. It will be seen that there is considerable falling off from last year, but an improvement over last month. The condition of spring wheat is still less favorable than that of the winter wheat, the average being 74.1 as against 90.9 in July of 1892 and 86.4 last month. In the greatest wheat producing regions the average is low. The outlook for the oat crop is particularly good, the condition being the highest since 1889 and about the same as last month. The average condition of the cotton crop has declined nearly three points since last month, standing now at 82.7, as compared with 86.9 in

the same month last year. The reports show cool nights, excessive rains and occasional regions of drought. Considerable damage is reported also from lice and other insects.

The management of the Michigan Central has been quick to recognize the value of the World's Fair as an unusually important means of education in industrial art, and arranged for a special train leaving Detroit 8:30 p. m. on Saturday, July 8, arriving at the World's Fair grounds the next morning, for the transportation of about 450 employés of the Michigan Central's car shops at Detroit. All of these employés and their families were furnished with passes for the purpose, and were given the privilege of coming back upon this special train or upon certain regular trains, and no other passengers were carried on the special. It is expected that the benefit that they will derive from the exhibition of industrial and decorative arts at the World's Fair will be highly appreciated by these workmen, and will ultimately redound to the highest interests of the company, in the improvement of their technical skill, the character of their work and the training of their perceptive and inventive faculties.

#### TRADE CATALOGUES.

*Worthington Steam Pumping Machinery.*—The Henry R. Worthington Co. has issued a special pamphlet giving information as to the nature, growth and present magnitude of its business, for distribution at the World's Fair. This pamphlet contains a plan of the grounds, showing the location of Worthington machinery which will be found at twenty different places, the exhibit being the largest variety of steam pumping ever installed in an exposition of this character. The entire water supply, except for drinking purposes, is furnished by a Worthington plant, and a great collection of pumps is to be seen in Machinery Hall. With this pamphlet the company issues also a plan of the ground on a larger scale than the one bound with the pamphlet, and a plan of a portion of the city of Chicago showing routes to Jackson Park.

*The Thousand Islands via the New York Central.*—The Passenger Department of the New York Central has adopted the sensible plan of publishing its summer resort literature and other advertising matter in small pamphlets, each devoted to a limited section. The latest issue is No. 10 of the "Four Track series," and contains 30 pages of text and direct process pictures showing the beauties of the region indicated in the title. On the title page the legend "Price 10 cents" appears in bold letters. This, we suppose, is to give added dignity to the document; we cannot imagine that such a restriction on its circulation is found generally necessary in practice.

*Electric Railroad Apparatus.* Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

The Westinghouse Co. has issued a very handsome special catalogue giving a sketch of single reduction motors, multiple generators and some of the more important apparatus necessary for the car equipment of electric railroads. The illustrations are half-tone reproductions of photographs, and being well made and carefully printed they are very satisfactory.

*Pennsylvania Railroad to the Columbian Exposition.*—This very carefully prepared pamphlet, which was published in several languages, by the Pennsylvania road several months ago, has been revised and slightly enlarged and a second edition issued. The new issue is bound in a handsome cover of original design.

#### Railroad Matters in Chicago.

The table of receipts of flour and grain by 11 railroads, published last week, was from June 1 to June 30, and not Jan. 1 to June 30, as printed.

*Passenger Traffic.*—Although the Western railroads centring here had a large traffic the past week the number of passengers carried failed to reach the estimates of enthusiastic writers on the daily journals by at least 50 per cent. Their guesses as to the number of people who would come in on the 3d and 4th were especially wild. Instead of 500,000 to 1,000,000, as predicted by at least one journal, the number was below 250,000. The officers of some lines, which have little suburban business, state that while they hauled long trains and their coaches were fairly well filled, their business was mainly from distant points. Manager St. John, of the Rock Island system, admitted that he was disappointed at the suburban travel. President Miller, of the Chicago, Milwaukee & St. Paul, said that while they had a heavy business, they could have accommodated a large increase, and that they did not find employment for all their coaches. The legitimate suburban travel of the Illinois Central, and Chicago & Northwestern is at all times large, and on the Fourth it amounted to a crush. The number of passengers carried from the city to the Fair by the Illinois Central was enormous. The Chicago, Burlington & Quincy also had a heavy suburban traffic, but their business from points within a radius of 100 to 250 miles was little if any larger than the daily average of the preceding week. Manager Merrill when asked if the anniversary travel met his expectations said that he did not make as high estimates as he had seen given in some of the daily papers, and in consequence he was

not greatly disappointed, and had no cause to complain, as the Burlington had a good patronage right along. The Chicago & Alton, Atchison, Topeka & Santa Fe, Chicago & Great Western, Wisconsin Central and Chicago & Eastern Illinois, although credited with handling a good increase of well filled coaches, were not overtaxed.

It is claimed by those who profess to understand the situation that the failure of visitors to attend the anniversary celebration from points 150 to 300 miles distant in greater numbers was mainly due to the fact that the tickets were too restricted as to time; those issued by the majority, if not all the roads, being limited to three days it was therefore plain that few cared to come from distant points even on half-fair rates, as their tickets gave insufficient time to visit the fair ere their expiration.

*Freight Traffic.*—The intervention of the National anniversary and the festivities attending its observance materially curtailed general business the past week, and in no direction was the interruption more apparent than in the freight moved by the railroads. The Western lines suffered a material loss on grain traffic compared with the week preceding. There was also a shrinkage compared with the opening week in July last year. The shrinkage, however, was less than might have been expected, as there were only five business days the past week, and as very low prices continue a bar to a free movement of such property in the country. The decrease in mixed freight both in and out of the city was also very moderate, and as regards the present, the roads have little to complain of. In fact their freight earnings are above the customary mid-year average, but the managers are not cheered by the sight of a constant accumulation of idle freight cars on side tracks, and the certainty that the "string" will become much longer ere the turning point in business demands increased transportation facilities. It is scarcely necessary to add that the change from quietude to activity depends on the movement of the new crop of small grain, and those who profess to understand the situation express the opinion that an early marketing of the latter is not likely. Their theory is that unless prices materially improve in the near future only the most needy producers will sell their grain until late in the season. The traffic of the roads traversing the winter wheat district will also be curtailed by the deficient yield in many important sections. If, however, the present promising outlook for other grain crops is realized, the loss from wheat traffic will be more than compensated later on. Hence, while the prospects for new business are not flattering, the indications for heavy traffic after mid-autumn are excellent.

The decrease in business is inducing railroad managers to look closely to the cost of operating their freight departments, and it is understood that material reductions are quietly being made in the forces of every Western road. Dealers in railroad supplies state that railroad officers show an unprecedented disposition to buy cautiously. They are also favored with lower prices than ever before made. This enables the roads to materially reduce the cost of betterments and at the same time maintain a high condition of tracks and equipments.

Below will be found a table showing the deliveries here of flour and grain by the granger railroads for the first half of the present and preceding year, and the proportion brought in by each road, as follows:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
C. & N. W. ....	675,512	15,657,000	712,836	11,440,000
Ill. Cent. ....	29,620	12,394,000	14,578	10,044,000
C. R. I. & P. ....	1,01,375	14,414,000	100,000	11,733,000
C. B. & Q. ....	4,010,000	27,900,000	376,700	17,567,000
C. & Alton. ....	41,675	2,610,000	81,977	2,872,000
C. & E. Ill. ....	6,650	2,456,000	750	1,880,000
C. M. & St. P. ....	692,635	12,208,000	679,625	14,500,000
Wabash. ....	27,421	2,126,000	37,556	2,117,000
C. & G. W. ....	334,863	4,195,000	495,646	3,932,000
A. T. & S. Fe. ....	22,513	6,206,000	3,856	5,526,000
Wis. Cent. ....	33,191	105,000	364,263	565,000
Special track. ....	32,413	201,000	36,841	593,000
Totals. ....	2,399,170	99,072,000	2,908,980	83,239,000

The total number of carloads of grain received at Chicago the first half of 1893 compares as follows with the same time in 1892, 1891 and 1890:

	1893.	1892.	1891.	1890.
A. T. & S. Fe. ....	7,785	8,082	5,006	12,652
C. B. & Q. ....	22,710	20,905	15,016	14,106
C. R. I. & P. ....	9,336	12,659	10,779	17,565
C. & Alton. ....	5,025	3,829	4,591	3,173
C. & N. W. ....	15,075	18,839	14,534	14,334
C. & E. Ill. ....	2,807	1,876	1,837	1,73
C. M. & St. P. ....	15,867	17,911	12,205	14,141
C. & G. W. ....	5,713	4,935	3,130	6,997
Ill. Cent. ....	15,335	12,740	16,098	7,659
Wabash. ....	3,599	2,182	3,714	2,158
Wis. Cent. ....	136	113	329	116
Other roads. ....	13,759	14,195	.....	.....
Total cars. ....	117,34	118,265	87,239	91,239

In comparing the carloads received the present year with the first half of 1892, it is seen there was a decrease of 918. This may seem inconsistent with the figures in the statement of bushels reported in the table just above, which shows an increase the current year of 15,833,000 bushels for the same time. This is accounted for by the fact that more large cars are now in use. On the Rock Island all the grain cars put on within a year

have a carrying capacity of 60,000 lbs. The majority of other roads traversing the grain sections also favor that size, although a few 70,000 lb. cars are said to have recently been placed on some lines. The equipment account of the Chicago, Burlington & Quincy shows a total of 23,406 box cars of all sizes on the main line, and 38,400 on the entire system. Of the former there are 2,000 thirty-ton cars, and the Manager of the road states that its future purchases will be of that size.

*Earnings.*—In view of the outlook for a moderate freight business the remainder of the summer, it is encouraging to know that the recent earnings of nearly all the railroads centring here made good gains in their June earnings over the corresponding month last year, when they were also above the average for the same time in preceding years. The most encouraging feature in connection with the gains was the high percentage of passenger traffic; hence net profits were larger in proportion than would be shown where the receipts from each class of business show customary proportions.

The volume of business in both the freight and passenger departments of all the leading roads for the expired six months of the year was also larger than for the corresponding time in 1892; and with few, if any, exceptions the net earnings were better. And although the low average rates realized for transportation left small profits in proportion to the gross receipts, it is generally understood that, when the six months' figures covering receipts and expenses are all in, the showing will be more satisfactory than heretofore supposed.

CHICAGO, July 10.

#### The British Iron Trade Association.

The British Iron Trade Association is able to boast of an influential if not extensive membership, and there is no doubt that its importance will increase in proportion as those who are engaged in the iron and steel industries discover how necessary it is to have their commercial interests carefully looked after.

So far as technical or scientific aspects of iron and steel working are concerned, the Iron & Steel Institute fulfills the chief demands that are made by the industry for improvements in research and methods of working; but from its very nature the Institute cannot attempt to supervise or protect and foster the commercial progress and development of its members' work, and therefore the British Iron Trade Association has a *raison d'être* in taking up these very points and working them for all they are worth.

At the last meeting of the Association, held in London on the 29th of June, several important papers of a strictly commercial or business nature were brought before the members and discussed at some length. Perhaps the most interesting of these to American readers would be the communication from Mr. J. S. Jeans (Secretary of the Association and late State Secretary of the Iron & Steel Institute), entitled, "On the Chicago World's Fair of 1893, and Its Lessons to the Iron Trade of Great Britain."

In this communication Mr. Jeans expresses his belief that the World's Fair presents a most excellent opportunity for reviewing the position and prospects of the iron trade of Great Britain in relation to that of other countries, and more especially in relation to that of the United States. It is an actual fact that Great Britain—for so long at the head of the iron manufactures—is at the present time left behind in the race by the American industries, not only in steelmaking and malleable iron manufacture, but in the output of pig iron, and even the mere production of iron ore.

In million tons, the output of pig iron last year was a little more than 9 for the United States, against 6½ for Great Britain; the increase, moreover, during the past 15 years has only been 0.1 per cent. for the latter, against 343 per cent. for the former. Similarly with the production of Bessemer steel, the increase of output during the same period in the United States was no less than 680 per cent., while in Great Britain it merely amounted to 97 per cent. Even in the output of open hearth steel, American makers are moving very rapidly, for, whereas in 1888 they produced only one fourth as much as English works, in 1892 the proportion was increased to one-half. These and other facts dealt with by Mr. Jeans very exhaustively, together with characteristics of the leading iron and steel exhibits in the World's Fair, lead him to several important conclusions, one of which concerns the question as to how far the Southern States are likely to proceed in the direction of acquiring the command of American markets.

In the Southern States, said Mr. Jeans, pig iron has been sold recently at a price which would favorably compete with either Scotch or Cleveland pig iron at the works; and he seems to agree with opinions already expressed to the effect that if the Southern railroad companies were to give moderately low freights, the export of pig iron to Europe is within measurable distance. He admits that even now the railroad charges for carrying pig iron from Southern works to port or to interior markets are remarkably low. It is, he says, quite a reasonable thing to suppose that pig iron may be shipped as ballast in cotton-carrying vessels from ports like Mobile at very easy rates for conveyance to Continental works as cheaply as from Glasgow or Middlesbrough, and if that should come about, the margin between the price of Southern pig and Scotch or Cleveland pig, de-

livered at the chief ports of the Continent, would be a narrow one, even now. That it will become narrower day by day is not only possible, but extremely probable.

Another paper brought before the Association was one by Mr. W. S. Caine, M. P., who took for his theme the present greatly depressed condition of British iron and steel industries, and the ease with which an improvement could be at once effected by authorizing greater progress in railroad building throughout India and the colonies, but more especially the former. There are in India districts nearly as large as France without either roads or railroads, yet possessing latent resources—mineral and agricultural—more varied than, and as valuable as, those of any European country. Years ago an indictment of this policy, or rather want of policy, was drawn up by Mr. Birkmyre, and his expressions still hold good: "To the American farmer, he said, the whole of the markets of Europe are open for the sale of grain and other farm produce not required for home consumption, while to the Indian farmer in the more neglected districts no calamity can be greater than a bumper harvest when the price of his grain falls to an almost nominal sum, when the greater part of the crop has to be either left standing or else buried to weevil away, and when at the same time the wretched peasant has to produce (too often by borrowing from a money lender at simply fabulous interest) his regular share of the fixed government assessment."

Suppose, says Mr. Caine, that the Indian Government were to provide the means of developing the railroad system; they could hardly fail to find it in the long run a good investment. India is extremely poor, undoubtedly, but its poverty may not be incurable. On the contrary, it is essentially due to the peasant having no outlet for the surplus produce of his land. Were proper facilities given, it is more than likely that instead of 11 million quarters only of wheat being exported from India to the United Kingdom, out of a total produce of 40 millions, the proportions would be reversed, and at least three-fourths of the entire crop exported, the home consumption being very small. In the absence of these facilities, however, the demand is supplied from the United States, where there is—in comparison—an enormous and economical transportation system, much of it specially adapted to meet the needs of this great trade.

LONDON, June, 1898.

F. B. L.

#### The Cartagena-Magdalena Railroad.

We are permitted to publish the following letter from Mr. S. B. McConnico, Vice-President and General Manager of the Cartagena-Magdalena Railroad Co., dated Cartagena, June 20. The Girardot Railroad, referred to in the letter, is in the hands of Pittsburgh capitalists and is an important line to connect Bogotá with the Upper Magdalena.

I am glad to know the "straws" at your end of the line indicate the wind to be blowing in the direction of Cartagena. This indication is even stronger down here. Our wharf was opened to public service on the 19th ult., since which time all vessels have been moored alongside and all have received perfect satisfaction, and the captains generally, of ships, express themselves in the highest terms regarding the construction of the wharf, ease of approach, and the facility of handling cargo. On the contrary, all with whom I have talked speak in doubtful terms as to the safety and facility of using the wharf at Savanilla, which was opened to service on the 16th inst.

On the 15th inst. we opened our first section from Cartagena to Turbaco, and since that time have been running a regular daily train both ways and a special excursion train on Sunday. The business, of course, is small at the outset, but quite as good as I anticipated, as we undoubtedly have got to kill the donkey by degrees. We have based our tariff on 10 cents per kilometre, first class, and six cents second class, paper money. Unfortunately our second class cars are entirely too good, and consequently they do the bulk of the business. We sell special tickets good for 30 rides between here and Turbaco at \$30 first class and \$20 second class.

These tickets will be much in use as soon as parties who contemplate making their homes in Turbaco and doing business here have made the move. Considering that the roadbed is new, it may be said to be in excellent condition. Some of the ballasting is yet incomplete, but when it is all in good shape, as we propose to put it, there will be no difficulty in making first rate time over it.

Our expectation is to open the second section, to Arjona, 15 kilometres beyond Turbaco, about Aug. 1, and by the end of the year we shall certainly have completed to the Dique crossing at Soplaviento, even if we have not reached the river, which latter I hardly hope for.

We have opened the coaling station here and have now on hand about 1,600 tons of the best Cumberland coal, which we are selling at \$8.00 to \$9.00 American gold, according to quantity.

The news from Girardot regarding Pennington's work is very satisfactory, if reliable, and as it comes from so many different sources I believe that it is. He is said to have 600 men actively at work and is steadily increasing the force. He has done well and has, at least, secured his concession for four years, during which time I feel confident he will be able to carry it to a conclusion, or so nearly so as to entitle him to an extension of time if he needs it. Mr. Huston, whom I saw on his return, was well pleased with the outlook of the enterprise, and Mr. De Long (whom I did not see, as he went to Barranquilla) was said to be highly enthusiastic.

Minister Goenaga writes me that Monsieur Ribon, of Paris, who owns the Dorada Railway, has made a contract with the government to extend the same on the Tolima side of the river to Girardot. This, of course, would be a great help to Pennington's enterprise, and I am given to understand that Ripón is fully able to carry it out.

#### The Effect of Competition Upon Railroad Construction and Operation.\*

BY HON. ALDACE F. WALKER.

[Continued from page 499.]

Coming now to the particular subject which I was invited to discuss, and keeping in mind the distinction which I have endeavored to make clear, there is no difficulty in answering the questions suggested by my theme. The primary effect of competition upon railway construction and railway operation is unquestionably valuable. The secondary effect is as unquestionably disastrous. The general principles governing the subject apply with full force to this particular industry.

##### I.—RAILWAY CONSTRUCTION.

The construction of railways may be carried on by private enterprise or by the state. To leave the construction of railways to private enterprise involves the employment of competition as a stimulant; to relegate the building of railways wholly to the state implies the abandonment of competition and the employment in its place of a unified scheme which shall treat the subject as a totality. In the United States the competitive method has been employed in full rigor. The course pursued in other nations will be rapidly sketched.

Looking first at our own country we find that although some of the states once entered upon the construction of transportation routes—for example, the rail and canal line proposed by Pennsylvania from Philadelphia to Pittsburgh, the state railways of Michigan, Indiana and Georgia, the North Cross railway of Illinois and the Hoosac Tunnel with its approaches in Massachusetts—these undertakings were all sooner or later abandoned. Contributions of money by municipalities have been customarily represented by corresponding securities of the corporation, either stock or mortgage bonds. The railways of the United States have been substantially constructed and are now altogether operated by private capital and as private enterprises.

Not only have charters for this purpose been freely granted by more than 40 different legislatures, including Congress, but in most of the states and territories general laws have been passed under which the building and management of railroads have been made as free as the engaging in any other business requiring large capital. From three to 13 men may incorporate themselves by the simple process of filing a certificate, and having done this the company may condemn any property by payment of its appraised value. Having acquired a right of way, it may engage in the business of transportation as fast as its rails are laid. It has also a right to connect with existing lines at all junction points upon equal terms. The result of this system has been a marvelous development of railway lines. Its primary effect has in many ways been beneficial. Without imposing burdens upon the states or the nation, this vast work has gone on, accumulating an aggregate capitalization of about ten billions of dollars, resulting in the building and equipping of nearly one hundred and seventy thousand miles of railroad of single, double and quadruple track, and with terminals of great value at all important points. It is the opinion of experts that this property could not be reproduced to-day for the amount at which it stands charged on the books of the several thousand corporations which have done the work. The freedom allowed in the construction of railways in the United States has provided ample transportation service for thickly settled regions and has made possible the habitation of remote and apparently barren districts; cities have been developed infinitely; others have been called into being, some of them, like Denver, apparently out of the desert.

Yet there is another side to the story. It will not do to claim that the American system of railway construction is the best that could be devised. A successful railroad excites the cupidity of observers and new roads have at times been constructed, not only to divide a profitable business which the old line was fully adequate to perform, but also as a species of legal blackmail through the necessity imposed of a purchase or a lease in order to prevent the older line from becoming unremunerative. This procedure results in a vast wastage of capital, serving no public use and involving the necessity of earnings sufficient to forever support a duplicated investment. In this respect competition in railway construction in the United States has been much too free, and its secondary effects at times have been evil.

In England, while competition in railway building has been active, the regulative principle has been applied that any new railway proposed must be shown to subserve some public interest not previously provided for. A similar useful principle has been adopted in Massachusetts, and, without doubt, every state should provide a check of this character upon unrestrained competition in the construction of railway lines. With proper restraints against the granting of unnecessary railroad charters, it would seem that for countries where capital is abundant and enterprise is dominant the competitive rather than the governmental method is to be preferred as a means for supplying the adequate railway facilities which modern civilization demands.

It must not be forgotten, however, that in many countries there are not found those accumulations of money seeking immediate investment which are required in order to carry out works of this vast character. In such cases the Government is the only agency through which such undertakings can be accomplished. This of itself accounts for the fact that in Russia and in many other countries few railway systems could have been built if their construction had been left to business competition solely. It is also undeniable that upon the Continent of Europe usage and its traditions clearly indicated the Government as the natural originating force in the development of transportation by rail. Moreover, the requirements of armies in times of peace and war have largely controlled the development of the European railway systems; conditions to which this country is not subject, although military considerations have by no means been wholly absent from our neighbors on the North.

In France a comprehensive scheme of railway construction was early matured, under which roads were built by chartered companies, with large contributions from the Government, to which the property was intended ultimately to revert. Changes in the general scheme have been made from time to time, the present basis being that of Government ownership in a small district in the Southwest, the remaining territory of the Republic being distributed among six great railway companies which are guaranteed a minimum dividend

\* A paper read before the World's Railway Commerce Congress at Chicago, June 23, 1898.

that in this country would be considered large, the State sharing in the excess of profit above a fixed percentage as to each, and the companies providing capital for necessary new construction under an arrangement by which all their advances are to be gradually repaid; so that the whole system ultimately is to become the property of the Government. This plan does not tend to the rapid increase of railway lines. Each company has a complete monopoly in its own district, there being no such thing as competition by either in the territory of the rest. The system has proved remunerative to the corporation, and the State has been able to exercise in many respects an efficient control over railway operations. But there can be little doubt that the development of railways in France would have proceeded much more rapidly if the avenues of private investment for their construction had been more widely opened.

In Germany, on the other hand, there was at first no attempt to lay out a general plan. When railway building had its inception the various States were in great measure independent and followed different policies. There were some state roads and more roads of private ownership and considerable freedom in their construction was apparent. Of late, however, a general absorption of railroad ownership in the State has been in progress, through the purchasing of private lines at prices which made it for the interest of their owners to sell, until Prussia has now become the leading exemplar of State-owned railroads. The original construction of the roads, however, was largely through the agency of private corporations and under the influence of competition upon private enterprise.

In Belgium the state began the building of railroads at an early day. Private companies were permitted to build lines that the government did not see fit to undertake, and about 1850 the state suspended the construction of new roads. After that time the work of enlarging the system went on very rapidly through a violent competition among private companies. In later years many of the lines so built were purchased by the government, until at the present time it owns much the larger part of all. The development of the system was influenced by competition until it became excessive, and, after considerable harm had been worked, was brought within control.

Railway building in Italy commenced when the various states were small, and the lines at first were not only disconnected, but isolated. After the consolidation of the government the ownership of the roads was acquired by it; but, after several years of state management, it was considered expedient to turn them over to private hands. Two great companies were organized, each controlling a system throughout the length of the kingdom, each having one trunk line and many branches, and both reaching most of the principal cities. This arrangement has placed in the hands of two powerful corporations for a long term of years the operation of the existing lines and the construction of new works. The details of the plan may be found in Professor Hadley's instructive book on Railway Transportation, to which I have freely referred for facts. It is obvious that, while there is competition between the two railway companies of Italy, it is a competition which is not likely to run to extremes or to develop excesses. On many accounts the present Italian system seems one of the best that could be devised.

A notable correspondence is observable between the Italian and the Canadian system. In Canada, also, two great companies substantially control all the railways of the Dominion, competing at important points, striving with each other for admission into new fields, and affording a large measure of competition, without subjecting the country to the evils which arise from the unrestrained competition of innumerable companies organized at the will of individuals.

This audience is accustomed to dealing with figures and I take great pleasure in submitting a few interesting data which have been kindly prepared for this purpose by Mr. C. C. McCain, the accomplished auditor of the Interstate Commerce Commission, showing the number of miles of railway, number of miles per 100 square miles of territory, and number of miles per 10,000 inhabitants, in the countries named, during the year 1891.

It will be observed that the number of miles per 100 square miles of territory in the entire United States is not nearly as large as in Great Britain, France and Germany. This, of course, was to be expected, in view of the fact that so much of the acreage of the United States still remains uninhabited. In the State of Illinois, however, which may be taken as fairly representative of the settled portion of this country, the number of miles per 100 square miles exceeds that of any other country named, while the number of miles per 10,000 population in that State, and also in the United States as a whole, is from 4 to 10 times as great as in any other country.

The figures are as follows:

	Miles of railway.	Miles per 100 sq. miles.	Miles per 10,000 pop.
Germany	28,982.63	12.87	5.28
France	23,578.73	11.27	6.09
Austria-Hungary	17,439.54	6.60	4.10
Italy	8,193.46	7.40	2.67
Spain	6,295.16	3.22	3.60
Great Britain and Ireland	20,181.05	16.57	5.34
United States	163,427.74	5.67	26.29
Illinois	10,223.13	18.25	26.20

The lesson to be drawn from this hasty survey of the history of railway building in several of the leading countries of the world is obvious. When financial conditions make its use available the competitive plan is sure to promote a wide and free development of railway transportation; and it is only to be deprecated when its use overruns the safe line of conservative investment and reaches out into ruinous excess. For this some restraint should be everywhere provided. The question is one of the granting of unnecessary charters, which can only be controlled by action of the various states, and such action cannot at once be expected. But capitalists can and do deprecate the construction of railroads which simply parallel existing lines, and it is properly becoming increasingly difficult to obtain money for that purpose.

[TO BE CONTINUED.]

#### Superannuation Funds on English Railroads and on the Grand Trunk.\*

It is distressing to a railway manager whose heart is in the right place to be under the necessity of terminating faithful services which are no longer efficient by reason of age, infirmity or any of the ills of life to which flesh is heir. The duty becomes painful when the em-

\* A paper by Mr. L. J. Sergeant, General Manager of the Grand Trunk, read at the Railroad Congress, Chicago, June 21, 1893.

ployé has dependents, no private means of support, and is, therefore, compelled to fall back upon the cold charity of relatives or friends. On the other hand it is a duty to the company he represents to take care that its business is in all its details vigorously and properly conducted. The argument may be used that engagements naturally hinge upon the performance of duty; that railway service is, like others, voluntary and transferable; that in payment of salary or wage, the company does all that it engaged to do, and that no contract exists to provide for such contingencies. But when the employé becomes, as it were, part of the service, when the performance of duty results in habit which leads him to neglect opportunities, when his sympathies create an *esprit de corps*, and when the whole of those co-operating causes lead to lifelong work in the interests of one company, there seems to be a moral claim upon the benevolence of employers who have benefited by faithful, if not brilliant, services, to provide some scheme of retiring allowance which will protect the individual in those dark days against penury and want.

These sentiments have influenced British railway companies in the establishment of superannuation associations which provide such retiring allowances to clerks and others coming within the rules, and I am under the impression that most of the railway companies of Great Britain have adopted that plan. The object of this paper is to describe the character of these associations and their practical results in the accumulation of funds to meet future contingencies.

Mr. Sargent then goes on to discuss some of the principles of life insurance, showing that the expectation of life in America is greater than in England. At the age of 60, the minimum retiring age usually fixed in pension schemes, the expectation is from 13.21 to 14.34 years, by the various tables. Coming to his main topic, Mr. Sargent says:

An object which English railway companies have had in view in the establishment of superannuation fund associations has not only been to provide for members after their active employment has been dispensed with, but to secure permanence of service and the relief of the individual from anxieties attendant upon the contemplation of the period of inability to provide for himself and his family—in fact, it has been thought that superannuation associations would permanently attach to the service better men and secure from them the better performance of their duties. The British system has the direct authority and approval of Parliament and of shareholders, who entirely and liberally sympathize with the effort by this means to raise the standard of efficiency.

The royal assent was given to an act for establishing the "Railway Clearing System Superannuation Fund Association" in 1873, which recited that it was expedient that provision should be made whereby the salaried officers and clerks of any railway company, then or thereafter admitted as partners to the clearing system, and the salaried officers and clerks of existing or future joint committees for railway purposes, having separate staffs of salaried officers and clerks, might become contributing members of the Fund, and that it was expedient that such railway companies and joint committees should be authorized to contribute to the Fund. Under the organization managing committees are appointed, trustees and arbitrator, a consulting physician and secretary. The payment of each member of the Fund per calendar month was to be 2½ per cent. on his salary for that month, subject to such additions thereto, exemptions therefrom, as the rules prescribe. The act makes it lawful for and incumbent on the Clearing-House Committee to contribute a like sum of 2½ per cent. for all their salaried officers and clerks, and it was made lawful for any railway companies, parties to the clearing-house system, and also for any joint committee to contribute.

In case any railway companies, parties to the clearing system, and having separate superannuation funds established for the benefit of their salaried officers and clerks, respectively receive into their service salaried officers or clerks, contributing members of the clearing-house fund, those companies were authorized to subscribe in respect of such clerks. The Railway Clearing House Committee may sue for contributions or subscriptions due. . . . The committee is to consist of 12 persons, six appointed by the Clearing Committee and six appointed by the contributing members. The act gives provision for amending and altering the rules.

An act to amend the foregoing received the royal assent on April 28, 1884.

It was also made lawful for the Clearing-House Committee mentioned in the Clearing Act (Ireland), 1860, to subscribe to the Fund.

The general rules of the Association provided for the admission of salaried officers and clerks as authorized by the act. Membership is compulsory upon every officer not over 45 years of age who shall be transferred from the weekly wage class to the salaried class. Every salaried officer or clerk admitted a contributing member whose age at the date of his joining the Fund shall be above 28 has, in addition to his ordinary contribution, to pay an extra amount according to a fixed scale varying from one per cent. of salary at the age of 29, to five per cent. at the age of 45. There is a provision as to the terms on which one or more years may be added to membership.

Any contributing member leaving the service of his own accord from any cause other than ill health or pecuniary fraud, is to receive back (but without interest) his own contributions, including any payments he may have made under certain rules, but not including extra payments he may have made under other rules. Contributing members who may be dismissed from the service from causes other than ill-health or pecuniary fraud, or become non-eligible by being transferred to the weekly wage class, are entitled to have like refunds.

Any contributing member leaving the service on account of ill health before he has been a member for 10 years is to have a refund equal to his own contributions and four per cent. simple interest on the sum from the date of payment until repayment, but his claim upon the Fund then ceases. If any contributing member be dismissed or should retire from the service on account of having committed a pecuniary fraud, his contributions and claim on the Fund are forfeited. The decisions of the committee in all matters are final. If any contributing member dies in the service before being superannuated, his representatives are to receive a sum equal to his own contributions, including extra payments and four per cent. interest on the sum.

In case of a member who dies after being superannuated, his own contributions less the amount he may have received by way of superannuation allowance is to be paid to his representatives without interest.

Any contributing member who has been a member for 10 years or upward, including any additional years added to his membership under the rules is, on attaining the age of 60 years, or at any time afterward, permitted to cease his contributions and be superannuated, and is thereupon for the rest of his life entitled to receive from the Fund a superannuation allowance or annuity according to the following scale computed upon the average of the salary which he has contributed, provided he thereupon retire from the service:

Years of contribution completed.	Yearly amount of superannuation in percentage of average salary.	Years of contribution completed.	Yearly amount of superannuation in percentage of average salary.
10	25	28	46
11	26	29	47
12	27	30	48
13	28	31	49
14	29	32	51
15	30	33	53
16	32	34	55
17	34	35	54
18	35	36	55
19	36	37	56
20	37	38	58
21	38	39	60
22	39	40	61
23	40	41	62
24	42	42	63
25	43	43	64
26	44	44	65
27	45	45	67

and upward.

Any claim for annuity to which a member may be entitled may be commuted by the Committee by a single payment, the amount thereof to be determined by the Actuary and thereupon such member ceases to have any claim upon the Fund. Any contributing member who has been such 10 years or upward, and who becomes incapacitated from performing his duties by reason of infirmity of body or mind, not the result of his own misconduct, is entitled to be superannuated on production of medical certificates subject to certain conditions.

Two consulting actuaries have been appointed who, after the expiration of 10 years, and thereafter every five years, are to examine the state of the Fund and report upon its liabilities, any differences of opinion between the consulting actuaries being referred to a third. Substantially the foregoing is the scheme of the Railway Clearing-System Superannuation Fund Association.

The accounts up to the year ending Sept. 30, 1892, show the total receipts during 19 years of this Superannuation Fund as being £565,831, of which, after deducting the expenses of management, fees, cash paid on account of members superannuated, cash paid to representatives of deceased members and cash returned to members leaving the service, there remains a balance of £477,319, invested mainly in government and railway securities. The total number of members who had joined to September, 1892, was 12,611. Of this number there had retired from the service 4,574; died, 591; superannuated, 110, leaving a remainder of 7,336, being the number of members contributing to the Fund at that date.

The valuation of the fund was made on Sept. 30, 1888, by Messrs. Ralph T. Hardy and Spencer C. Thomson, the actuaries appointed, and they reported that the deaths showed a lower rate of mortality than the English life table, which feature of the Fund is confirmed by that of other similar associations; that if all the members retired at the age of 60, under certain conditions, the Fund would be insufficient by £318,037 or £202,463; that if all the members retired at the age of 65, with certain provisos, the invested Funds were in excess of the estimated liabilities by £50,203 or £59,893 respectively.

On the assumption that retirement would take place at the average of 62½ the probable position of the Fund is reported as showing a deficiency of £71,285 and the actuaries recommend that the benefits remain unaltered on the understanding that the rate of interest is maintained at 4 per cent., but that all future admissions be upon terms that are fully adequate.

The London & North Western Railway Company have established two superannuation associations, the first for officers and salaried clerks, and second the "Workingmen's Provident and Pension Fund," subscribed to by the weekly wages staff.\*

The Superannuation Fund Association has been in operation for 40 years. It will be seen from the balance sheet that the total receipts during those 40 years amounted to £974,845, and that after paying all the claims upon the Fund under the rules the balance in the hands of the London & North Western Railway Company at interest amounted on March 31 last to £742,537.

A very valuable report made by three actuaries on the Superannuation Fund assumes that, as in the case of the Railway Clearing House, if retirement were universal at the age of 60 there would be a deficiency; if at the age of 65 there would be a surplus, but it is assumed that the probable financial position lies midway between these ages, and that pensions will be taken at the age of 62½. The Fund, therefore, for all practical purposes is considered solvent.

I am also favored with copies of the Rules of the Great Western Railway Salaried Officers' Superannuation Fund, and also of a like Fund established for the purpose of providing a weekly allowance to servants of that company after a length of service or when permanently disabled from fulfilling their usual employment by accident occurring in the discharge of duty or by bodily or mental infirmity.

The first-named association provides that the members make a contribution of 2½ per cent. from their salaries, the company at the end of each half year contributing out of its revenues a sum equal in amount to that which during the same half year has been contributed by the officers and clerks.

The Great Western Railway Act of 1864 provided for the establishment of this Superannuation Fund, the benefits and application of which are substantially the same as those above referred to.

Clause 6 of the rules provides that every member who shall retire from the service at 60 years of age shall be entitled by way of superannuation to an annual allowance for the remainder of his life for and in respect of every year of his membership equal to one-fiftieth of his maximum salary during that period, provided that such superannuation allowance may, in no case, exceed in amount 2s. 3d. of the maximum salary of any officer or clerk.

The statement of accounts to Jan. 31, 1893, shows that the Superannuation Fund Association has received during the 28 years ended Jan. 31, 1893, £192,221, and that investments exist representing the net balance in hand after deductions, according to the rules, of £440,631. At

the end of January last the number of members contributing was 3,886.

The Servants' Pension Fund consists of the moneys received by certain associations belonging to companies consolidated with the Great Western and membership contributions of 3d. per week and in certain cases 6d. per week, as well as payments out of the revenues of the Great Western equal in amount to the sum which during the same half year had been realized by the ordinary contributions of the members to the Fund. Any member who after 30 years' membership under the rules has attained the age of 55 years is entitled on his retirement from the service of the company to a pension of 10s. per week with an additional allowance of 1s. per week for every completed term of five years' membership beyond the first 30 years. Any permanently disabled member not entitled to pension under the rules may be awarded out of the Fund 4s. a week in addition to payment by the Great Western Provident Society until he become entitled to a pension. The rules make further provision for variation of allowances, payments to widows or children and reimbursement of members in cases of leaving or being dismissed from the service. The Servants' Pension Fund to Dec. 31, 1892, shows a total receipt of £118,328 and a net balance of £108,071.

The Great Northern Superannuation Association covers three classes, the principal officers and clerks, station masters, inspectors, firemen and engine drivers and servants of any other grade which may from time to time be admitted by the managing committee.

The rules provide for a scale of superannuation allowances for joint contribution substantially as in the above mentioned cases and the retiring age is put at 60. The total receipts from Jan. 1, 1875, to Dec. 31, 1892 (18 years), were £338,318 and the balance sheet after making provisions for payments under the rules shows its present investments as amounting to £280,812. Sir Henry Oakley tells me that the whole of the money is invested with the company and returns four per cent.

The London, Brighton & South Coast Superannuation Fund provides that all principal officers, their assistants, clerks, station masters, booking clerks, ticket collectors, guards, policemen, signalmen, pointsmen, permanent way superintendents, inspectors, and timekeepers, locomotive and carriage foremen and engine drivers, whose ages shall not exceed 40 years at the time of admission, shall upon their admission to the service and so long as they continue therein be contributing members, and all other officials promoted to either of those ranks. The contributions to the fund are joint, the members contributing 2½ per cent. of their salaries and the company 2½. The Secretary and General Manager of this company inform me that their corporation contemplate some modifications in the interest of members such as increasing the maximum pension to two-thirds instead of one-half the average salaries and the refunding to representatives of deceased members the difference between amounts paid in pensions and the amounts annually subscribed by them.

The Great Eastern Company have three superannuation or pension funds, one applicable to salaried officers contributing 2½ per cent. of salaries, the company supplementing the fund to a like extent; the second pension fund is for the exclusive benefit of the servants of the company above 15 years of age whose wages exceed 12 shillings a week, and who are not entitled to the benefits of the superannuation fund. The contributions of the men according to the class to which they belong are from 5d. to 2d. per week, the company contributing like amounts. Additional contributions are allowed for back payments. Retirement on pension is permissible at the age of 65 years to members who shall have made payments to the fund during membership equivalent to contributions applicable to their class for 30 years.

The third scheme of retirement is called the Supplemental Old Age Relief Fund. It was established by the directors of the company for the benefit of their servants on the wages staff between the ages of 55 and 65. The member has the option of making a payment of £100, thus securing the maximum pension of 10 shillings a week either in a lump sum or by weekly installments. Compound interest at the rate of 4 per cent. is allowed and every payment (including interest) of £10 will secure a pension of 1 shilling a week to the member on retirement at or after 65 years of age. There are rules in favor of the member in case of death.

The Manchester, Sheffield & Lincolnshire, as well as the South Eastern, are parties to the Clearing-House system of superannuation. The North Eastern have a superannuation fund scheme applicable to all its salaried officers and servants, but no established fund of the kind applicable to the wages staff, although Mr. Gibb, the General Manager of the line, informs me that such a scheme is under consideration at the present time. An interesting fact in connection with the North Eastern Superannuation fund is that it has been found that the average age at the date of coming on the fund of those who have been pensioned was 67½ years.

The Caledonian Railway also have an association on the same basis as the foregoing. It has been in existence for 20 years. The present membership is 1,405. There have died during that period 195, there have left the service 1,432, and there have been superannuated 50. The funds of the association are vested with the company and receive the same interest as is paid from time to time on their debenture debt. Originally the pension age was 60, but on the suggestion of their actuary it has been raised to 65 for all members joining on and after July 1, 1888.

The London & South Western scheme contemplates membership on the part of every salaried officer who, on May 1, 1864, was not less than 20 years of age and under 50. The contribution is the same as the foregoing, 2½ per cent. upon salaries by the member, and 2½ per cent. by the company. The retiring age is 60. The allowances made on retirement are subject to tables of annuities attached to the charter of the association.

The Lancashire & Yorkshire Superannuation Fund was established in 1873, and is substantially on the same basis as the above mentioned. The total receipts of the association from July 1, 1873, to June 30, 1892, amounted to £136,754, and the balance sheet shows an amount in the hands of the Lancashire & Yorkshire Railway Company after deduction, according to the rules, of £113,258. The North British Railway Association fixes the age of 40 as that up to which members are eligible, and contains a provision that officers upward of 40 at the time of entering the service may be admitted at the option of the committee by special arrangement. The company contributes also in this case an equal amount to that paid by the members. The total amount contributed from Oct. 1, 1883, to Dec. 1, 1892, appears to have been £83,768, and the net amount at that date £65,771.

The Great Southern & Western Railway Company have three Funds connected with that company: the first, the superannuation fund for officers; the second, su-

\* A separate paper by Mr. J. Parkhouse, Secretary of the London & North Western Fund, follows at the end of this article.

perannuation fund for enginemen and firemen, and the third, a sick fund for men. The Superannuation Fund Association shows a total receipt during 13 years of £34,216, and a net balance of £29,550. In the case of the Locomotive Fund, each member subscribes two shillings per week, and there are at present 253 members. On Dec. 31 the Fund amounted, with interest, to £32,367, and with repayments and allowances under the rules a balance remained of £20,833, more than sufficient to pay off all liabilities.

It remains only to deal with the superannuation scheme which has been established in connection with the Grand Trunk Railway Company of Canada. This association was formed in 1874 and was based upon the English practice. The members were to consist of salaried officers, clerks, passenger and freight agents, telegraph operators, roadmasters, inspectors in any department and foremen in the mechanical department. The applicant was eligible if not over the age of 37 years. Payments 2½ per cent. by the member, 2½ per cent. by the company. The age of retirement is 55 years and the member is entitled in the way of superannuation to an annual allowance for the remainder of his life equal to one-sixtieth of his then salary for and in respect of every year during which he shall have been a member of the Fund, but such superannuation allowance may in no case exceed in a month two-thirds of the average annual salary of such officer, clerk or other employé for and in respect of the years during which he shall have contributed to the Fund. The usual provision exists as to return of contributions under certain circumstances. The investment of securities is limited in the discretion of the committee of management to Dominion government securities, provincial or municipal bonds or stock, Grand Trunk mortgage bonds, or debenture stock, Chicago & Grand Trunk mortgage bonds, mortgages on real estate in the Dominion of Canada. The total amount received to Dec. 31, 1892, was \$339,684.14 = £80,071. After payments of refunds and other outgoings the net amount in hand or invested on Dec. 31 was \$357,719.49 = £73,504. The practical working and solvency of the Fund have been the subject of investigation during the two quinquennial periods by the actuaries, Messrs. Ralph P. Hardy and Frederick Hendriks, of London, England. A statement made to the members by the then Secretary of the Association, copy annexed, embodies the views of those gentlemen who stated their practical conclusion to be that for all reasonable purposes it may fairly be taken that the Fund was solvent in 1886. The rate received on investments was then 5½ per cent. The entire amount invested yielded 5.47 per cent. per annum. A report to the same effect was made by those gentlemen in their valuation for the previous quinquennial period ending Dec. 31, 1881. A third quinquennial valuation by the actuaries is now being made.

From the foregoing it will be seen that the English railway companies have for many years recognized the principle of superannuation payments to their salaried officers and clerks; that some companies have extended the same principle to the lower grades of the service—that is, the men who are paid by wages as contradistinguished from salaries; that these funds have in the aggregate on the expiration of years amounted to very large sums; that they are derived as a rule from the deduction of 2½ per cent. from the salaries of officers, supplemented by like payments on the part of the company; that the age for optional retirement is generally 60; that the rate of interest in England on investments is lower than on the American Continent; that it may be inferred from the almost universal adoption of the principle that its advantageous results have been realized by experience; that members appreciate its benefits; that the superannuation principle has the effect of bringing about more satisfactory relations between employers and employed; that it leads to permanence of service; that the tendency of the employed is not to retire from active occupation until compelled or induced from circumstances to adopt that course as indicated in the case of the North Eastern Association, on which the actual retirement took place at the average age of 67½ years, and other experience.

#### LONDON & NORTH WESTERN SUPERANNUATION FUND.

The London & North Western Railway Superannuation Fund has now been in existence 40 years. It is the largest and oldest railway superannuation fund in the United Kingdom.

The following are its salient features: Every salaried officer on entering the service, under 25 years of age, is compelled to join, paying 2½ per cent. on his salary monthly, the company simultaneously contributing a like sum. They are also the trustees and bankers of the Fund, and as such credit it with interest at the rate of four per cent. per annum. Pension can be claimed by any member after attaining age, 60, as per scale on page 14 of Deed Poll; and any one who has been a contributor for not less than 10 years, who, by reason of failing health, is incapacitated from performing his duties, can claim his pension, as per scale, prior to attaining 60 years of age.

The committee have power, on the application of a superannuated member, to commute his pension, but they cannot, under any circumstances, give him more than five years' purchase.

In the event of any member dying before being pensioned, his representatives receive a sum equal to a half year's average salary; but if that amount be less than the total of his own and the company's contributions on his behalf, then the total amount of such united contributions is paid. Should a superannuated member die before he has received as pension the amount he and the company contributed to the Fund, his representatives receive the difference between such total contributions and the pension paid.

Members resigning the service on their own accord are repaid one-half of their own contributions. Members dismissed by the company are repaid the whole of their own contributions; and members dismissed for fraud forfeit all, but at the discretion of the committee.

#### GENERAL REMARKS.

When the L. & N. W. Fund was started in 1853 any one was allowed to join during the first year irrespective of age and numbers availed themselves of the offer, so that of the first fifty who retired through old age and took their pension, only one joined the Fund under forty years of age, and as the actuaries in examining

\* I see upon that point that Mr. Newdegate has recently presented to Parliament a petition signed by 220 employés of the London & North Western Railway out of 235 at the company's works in Nuneaton praying for permission to contract themselves out of the Employers' Liability Bill. Their reason for so doing is that the company subscribed handsomely to an accident assurance fund, and it is feared that if the men came under the new act the fund would be a heavy loser by the company withdrawing its support.

the Fund nine years ago, for the time informed us that all persons entering after age 25 were a loss, it will at once be seen how the Fund was handicapped by many who joined during the first year. Of the present number of contributing members (6,547) about 1,000 commenced to contribute at varying ages between 25 and 40, so that it will be some years yet before all these unprofitable members are worked off.

I mention these points because large numbers of the members seeing the balance in hand is increasing so rapidly year by year, think that the benefits might be very considerably improved; it is quite possible they might, but the increase in the balance in hand is no proof. The number of pensioners now on the Fund is 156, but a statement was compiled showing the numbers contributing in 1883 in the various ages, and after deducting the numbers that will fall out through secessions (i. e., resignation, dismissal and death), it was found that in the year 1917 we should have 392 pensioners on the Fund if they deferred taking their pensions to age 65, but if they elected to take their pensions at 60, as they might, then we should have 591 on the Fund; this is apart from those coming on the Fund through incapacity, and up to now almost as many have been pensioned through incapacity as old age.\* We have also, since the above forecast as to pensioners was made, increased our contributing members by over 1,200, all of whom are very young. These figures are referred to to show that we have not yet reached anything like our maximum liability as some suppose.

The Fund is now on the eve of its next quinquennial valuation by the actuaries.

#### International and Interstate Railroad Arrangements.

BY G. R. BLANCHARD, COMMISSIONER CENTRAL TRAFFIC ASSOCIATION.

To speak to the subject of "International and interstate railway arrangements" is to consider the best agencies and greatest advances of modern civilization. The bonds of extended mercantile interest are stronger than international treaties. Commerce is the truest diplomacy and merchants are its ambassadors. When two locomotives or steamers stand at the borders of nations or states waiting to intermingle peoples and their goods, they are stronger forces than contending statesmen on opposite sides of state issues, because they represent progress, equity and necessity. Therefore state craft is pushed by the locomotive until there is no civilized state or nation now so strong that it can isolate itself commercially and deny railways passage across the frontiers. As one illustration, German railways have over 200 tariffs in connection with railways outside its boundaries, and this equalization of places and districts is many times multiplied nationally and internationally in the states of the world. The Victoria, Cantilever and Suspension bridges and the Port Huron tunnel unite Canada and the Union commercially as well as physically. Mexico is as much in the Union to-day commercially as are some of our territories. The St. Gotthard and Mont Cenis tunnels attest the progress made in the commercial fusion of nations which but a few years prior were antagonist. The growing sentiment of England, France and continental Europe in favor of the tunnel under the English channel is another instance of the preponderance of commercial over mere political considerations.

A more recent estimate of the value of the international railway intercommunications is the endorsement by the 17 states composing the pan-American congress of 1889 of the project to unite the railway systems of North and South America; an achievement which, in the amply fortified opinion of W. E. Curtis, the accomplished secretary of the pan-American Congress, is easier of accomplishment than the engineering difficulties encountered and overcome by railways in Colorado and Oregon. I cannot refrain from saying as an American that the discontinuance by our government of the appropriation of \$65,000 per year, which had been made for three years under the former administration to perfect this survey, but discontinued by the last congress, was a step backward in the development of American commerce and the progress of peoples closely related to ours.

It is fitting that the consideration of international railway arrangements should touch upon the relations between Canadian railway carriers and our own. When the Interstate Commerce act was passed, in 1887, it was with the full knowledge of our legislators that limitations contained in that law did not exist in the laws of Canada relative to its railroad carriers. It was, however, the intent of the act that traffic between points in Canada and points in the United States, and between points in the United States which passed through Canada *en route*, should be governed by the conditions of the act, and, so far as I am aware, the Canadian carriers have given as much co-operation to the law, as to those classes of traffic, as have the American lines. It is a fair and just demand of United States railways, and conceded by those in Canada, that, so far as American lines are bound by the terms and conditions of the act upon the competitive commerce which they transport, the same stipulations should apply to the same commerce when handled by the railways through Canada in so far as the laws or negotiations of the United States can secure that result. In other words the broadest international reciprocity dictates that the nation should not grant conditions to the commerce of other countries when passing through our own which will give them greater benefits as to such traffic than our own; or if they cannot control or influence the action of our border nations in that respect, congress should not apply conditions to American railways or the commerce passing over them which place them at a disadvantage with foreign carriers and commerce. While advocating the extension of our commerce in all other directions, we should not do anything to unjustly restrict the interchanges with our northern neighbors.

It was intended that earlier railways should simply be iron highways assisting or replacing wagon roads or the waterways, and that any shipper might place his car thereon as any one can put a wagon on a highway or a boat upon a river, ocean, lake or canal. They contemplated a system of rail tolls for the services of the roadway, or roadway and power. I possess interesting early tariffs of the Baltimore & Ohio company, in which various charges for tolls are set forth. The owner of the car then presented his own bills to consignees for the aggregate of the tolls he had paid and his charges if he carried freight for others, and

\* Age 64 is the average at which such members take their pensions.

† Extracts from an address delivered at the World's Railway Commerce Congress, Chicago.

as is the usage by canal to-day. Naturally, as commerce grew, a multiplicity of such owners produced senseless rivalries and reduced individual earnings. These resulted in confusion of movement, and the railways were solicited to assume the entire service, which they did. Then came—not swiftly at first—the contentions of towns and districts for carrying facilities, until localities as well as nations knew that transportation isolation or comparative disability meant commercial stagnation or retrogression, and our nation now possesses half the railways of the world.

You have often been told how, in order to prepare the way of the locomotive, valleys have been filled, cities traversed on arches of stone and mountains leveled, wide streams bridged, tunnels arched through quicksands under waters, and pierced through eternal granites. The engineers' congress may well tell and be proud of the achievements of its great profession in those respects. My purpose in repeating these trite things now is to say that in doing these great works no other calling has so fully engaged the highest attainments and energies of men. Unlike the arts, steam had no examples. It was not a system of long creative evolution. It was an original study, and it has been conned, wrought and solved with a patience, brilliancy and security which entitle the projectors, builders and administrators to public gratitude. I can only measure what is due to them of public thanks and appreciation by asking you to imagine the beseechings which would go out to-morrow to railway capitalists and builders if the morning found the railways of Illinois gone from sight. To note how thousands are now affected by the delay of an hour or a day is to measure the value of their undertakings.

#### Proposed High Level Bridge Across the Mersey at Liverpool.

*Industries* for June 2, 1893, shows a design of a high bridge, the work of two English engineers, J. J. Webster and J. T. Wood. The design shows two shore spans of 1,100 ft. each and one centre span 1,185 ft., and a clear headway of 150 ft. above high tide water.

The bridge is to consist of two steel arch ribs, each rib comprising eight octagonal steel tubes, which are braced and tied together in a circle around a large cylindrical tube. The cross-section of the rib gives eight small circular or octagonal tubes placed at equal distances from the circumference of one large circular tube. The advantage claimed for such an arrangement of several shapes, over the one large cylindrical or rectangular form, generally employed, is that it offers less resistance to the wind. This may be, but the introduction of so many parts and of such shapes must increase and complicate the details beyond all comparison. And the fact that these details are not given nor described seems to warrant the belief that the promoters have yet much to consider before the bridge is built.

The ribs are hinged at the crown and springing line to allow for the changes due to temperature.

Three-quarters of the floor system, with its continuous trussing, is to be suspended from these arch ribs, and the other quarter, which constitutes the approaches for each arch span, are supported on elliptical steel arches resting on columns which have a footing upon the haunches of the arch ribs.

The floor proposed is of corrugated steel plates carrying a macadam pavement and paved footways. The roadway is 45 ft. wide and the two footways 7½ ft. each. There are two electric tramways over the driveways. As much of the traffic will be from the docks, near shore. The abutments have been designed to receive six large hydraulic lifts, which will take the largest loaded trucks from the river front to the level of the bridge and thus save the long haul by way of the approaches.

The total estimated cost of the structure including approaches, cost of property and compensation to coterminous owners is \$8,650,000. No estimate of the revenue that are to be had for such a large investment is given, nor is it suggested that the traffic would warrant such an expensive structure.

The novelty of the design, the lack of detail and the neglect to present the financial side of the project would lead one to feel that the time for its erection is a long way off.

#### TECHNICAL.

##### Manufacturing and Business.

The Riehlé Bros. Testing Machine Co., Philadelphia, has just received an order from the Civil Engineering Department of the Cornell University for a 400,000-lb. vertical screw power testing machine with all the latest automatic and electric attachments, recording diagram apparatus and special tools for testing girders up to 18 ft. in length, transversely; also for crushing columns 10 ft. high and for applying tensile strain to rods, bars, etc., 10 ft. long, stretching them, if necessary, 25 per cent. of their length before breaking. This machine is said to be the largest screw power testing machine in the country, if not in the world. The Riehlé Co. not long ago placed a horizontal hydraulic testing machine of the same capacity (400,000 lbs. or 200 tons) in the Boston Navy Yard. This machine weighs by means of scale levers, and is, no doubt, the largest hydraulic machine with levers in the United States.

Mr. A. W. Van Dorst, President and Manager of the Van Dorst Railway Supply Co., of Washington, D. C., announces that the company is now ready to license all responsible firms (desiring to manufacture M. C. B. car coupling) making application Aug. 1, to manufacture, on a low royalty, the Van Dorst cushioned equipments, which include the "cushioned automatic car coupler," M. C. B. type; the "cushioned carrier iron," the "cushioned single or double-acting continuous drawgears," and the "cushioned locomotive tender equipment." Tests made

and a service of the above equipments for a period of from three to five years have demonstrated their practical value.

The Pittsburgh Testing Laboratory, which has been in the past under the sole proprietorship of Hunt & Clapp, was reorganized upon July 1, and is now owned by a limited partnership, under the State laws of Pennsylvania, under the title of "Pittsburgh Testing Laboratory, Limited." The location of the Central Office will remain at No. 116 Water street, Pittsburgh. The management and personnel of the new concern are in no wise changed from its past organization, with the exception that some of the old employees have been admitted to the new limited company, in addition to the former proprietors, Messrs. Alfred E. Hunt and George H. Clapp. The officers of the Pittsburgh Testing Laboratory, Ltd., are as follows: G. H. Clapp, Chairman; Alfred E. Hunt, Vice-Chairman and Treasurer; J. M. Bailey, Secretary; A. B. Bellows, General Manager, and L. S. McKeever, Assistant Treasurer.

The Robinson-Rea Manufacturing Co., Pittsburgh, will equip its new foundry with two large electric traveling cranes built by Wm. Sellers & Co., incorporated, of Philadelphia. Each of these cranes has a span of 80 ft., one being of 30 tons capacity and the other 80 tons. The cranes are provided with a double trolley, a distinctive feature which enables the cranes to be engaged on two separate pieces of work at the same time, or both trolleys can be used together, an excellent feature where heavy work is done.

The Philadelphia Engineering Works, limited, have an order from the Pennsylvania Railroad Co., for one 13 x 26 special Corliss engine. Philadelphia Corliss engines are being built for the Delaware County Construction Co., the Chatham Manufacturing Co., of Elkin, N. C., and other firms, and for the Pennsylvania General Electric Co., one 20 x 50 x 54 gross compound condensing engine is being erected.

The Standard Air Brake Co., of New York, has been incorporated in West Virginia to manufacture and sell airbrakes. The officers are: J. Heron Crosman, President; George Cleveland, Vice-President; Samuel A. Newman, Secretary and Treasurer, and Henry L. Howe, General Superintendent.

The United States Wind Engine & Pump Co., of Batavia, Ill., recently closed a large contract in the Lake Superior lumber district for a year's supply of white pine tank lumber, and has just received the first installment. It made the entire cargo of a steamer from Lake Superior to Chicago; there it was unloaded on the C. & N. W. docks and was sent to Batavia, Ill., as a special train, consisting of 31 cars. This is the first vessel that ever came to Chicago loaded with tank lumber, and it is the first special train of tank lumber that was ever hauled out of Chicago or from any other point. This is one of five similar lots that the company expect to receive during the season.

The Terre Haute Car & Manufacturing Co. made an assignment on July 11 to H. J. Baker. The liabilities are \$191,165, with an additional \$84,607 of contingent liabilities. The assets are placed at \$599,082, of which \$195,000 is for the plant and \$110,000 for stock on hand. The remainder consists of bills receivable. The assignment was caused by the stringency in the market, the immediate cause being the failure of Post, Martin & Co., of New York, to fulfil their contracts with the company.

The Seamless brake is being put on 20 platform cars being built by the Bloomsburg Car Co., for export to Cuba. This brake gear was described in the *Railroad Gazette* of May 12 last. It is made by the Seamless Brake Co., which has offices at Bloomsburg, Pa., and 41 Dey street, New York City.

The Conquest Tie & Lumber Co. was organized on June 23 last, and has purchased the business of P. L. Conquest & Co., of Richmond, Va., large manufacturers and shippers of railroad ties. The business will be continued as heretofore. The company has branch offices at Brunswick, Ga., and Norfolk, Va.

The Polson Iron Works Co. has decided to close up the shipbuilding branch of the business at Owen Sound, Ont., and is offering for sale all the machinery and plant of the Owen Sound steel ship yard, also the dry dock with three acres of land and shipbuilding yard, consisting of 13 acres of land, with buildings and pier 600 ft. long.

The Northern Pacific has erected four Mills railroad gates at the crossing on Commercial street, Seattle, Wash.

The Owego Bridge Co., of Owego, N. Y., capital stock \$50,000, has been chartered for the building of iron and steel bridges.

The Ashby Randall Journal Bearing Co., of St. Louis, has been formed to manufacture journal bearing boxes, by F. J. Randall and J. L. Ashby, of Jennings, Mo.

The Gravity Turntable Co., of Albany, N. Y., has been incorporated for the manufacture of locomotive turntables, etc. Herman Harder, W. G. Saunders, of Albany, and J. Saunders of Coxsackie, N. Y., are among the incorporators.

#### Iron and Steel.

The Troy Iron and Steel Works announces that owing to dullness in the steel market the company's steel plant in Troy and a portion of the blast furnace plant will be closed.

#### New Stations and Shops.

The Berlin Iron Bridge Co. has received from E. D. Leavitt, Consulting Engineer of the Calumet & Hecla Mining Co., the contract for the iron roof over its new engine house. The building will be 80 ft. wide and 200 ft. long.

The National Railway Spring Co., of Oswego, N. Y., is building an addition to its factory 100 x 125 ft.

The Chicago, Burlington & Quincy is building a suburban station for the accommodation of its suburban traffic, at Second and Mullanphy streets, on the north side of St. Louis.

The Buffalo, Rochester & Pittsburgh is putting up a new station at Bradford, Pa., to take the place of the one recently burned. It will be of Ohio stone and Lewis Run brick. The plans for the freighthouse are not ready.

The Pittsburgh, Wheeling & Kentucky, operated by the Pennsylvania, has been trying for more than 10 years to get plans for a new passenger station accepted by the city council of Wheeling, W. Va. It has prepared plans for a structure which will cost \$50,000 and submitted them, asking that a few feet of the public wharf be vacated to give room for the additional tracks which were needed for the new station. This was opposed by the river men, and the matter has been before councils' committees on wharves and streets for all this time. The river men have always been successful against the encroachment, and the railroad has been shut out. Last Friday a new plan was presented by the railroad engineers, which contemplated taking a part of the ground needed from a city street and part of it from the wharf. This compromise was agreed to, and the station will be built, an ordinance granting the concessions desired having been prepared and agreed to. The new station will be used by the Pittsburgh, Wheeling & Kentucky and Ohio River roads, and will contain all the offices of the two lines.

It is to be three stories in height, and will be modern in all its appointments.

#### The Compromise Standard for Bridge Loads.

Mr. Waddell has sent out a card announcing the result of the ballot on his proposed Compromise Standard System of Live Loads for Railroad Bridges. The total ballots issued were 284, replies 175, making the percentage heard from 62, and that not heard from 38. Of those who replied, 23 pleaded illness or lack of time, three excused themselves as not being sufficiently posted, 16 were opposed to balloting, and 123 sent in ballots. Of the latter 115 are in favor of the proposed "Compromise Standard" and 13 are not in favor, making the percentages for the ballot as follows:

In favor of proposed standard, 90 per cent.

Opposed to proposed standard, 10 per cent.

The promised diagrams of equivalent uniform loads and end shears will be issued soon.

#### The Hinckley Brake Slack Adjuster.

The Hinckley Brake Company has published a new, 1893, catalogue illustrating different attachments of the automatic brake slack adjuster. The company invites special attention to the new equipment C. The automatic action is the same as equipment A, but the bracket has been made triangular in shape and the operating lever of the adjuster acts along this triangle as along an inclined plane, thus deflecting it enough to engage a new tooth when the movement of the rod is unusually great. This equipment is intended for those rods that travel in the direction of their length when the brakes are applied. Only one adjuster is required for each car, and this is encased in a dust and water proof case. The main features of the adjuster have not been changed. They have been illustrated and described in the *Railroad Gazette*, pages 363 and 822, 1892.

#### Armor Tests.

Some important tests of armor plate were made at the Indian Head proving grounds on Wednesday. Two plates were tested, at each of which three projectiles were fired. The tests were for acceptance and for premium, the contract specifying that if the plates resisted penetration at a certain velocity a premium of \$30 a ton would be added to the contract price of \$575 a ton. The first test was of a 9-in. plate 6 ft. 4 in. x 9 ft. 7 in. of nickel steel, weighing 10 tons, made by the Carnegie company; it was not Harveyized. Three Holtzer 250-lb. projectiles were fired from an 8-in. gun at a distance of 58 ft. The first, with a striking velocity of 1,400 ft., penetrated 11.7 in. The second, with a striking velocity of 1,683 ft., went through the plate and 3 ft. of oak backing and was buried in the earth. The third, with a velocity of 1,536 ft., penetrated 14 1/4 in. No cracks were developed, and the plate was accepted, although it did not win a premium.

The second plate tested was a curved plate from the Bethlehem company, also of nickel steel, not Harveyized. This was 8 ft. 4 in. x 12 ft. 1 in., 17 in. thick, weighing 31 1/2 tons, also of nickel steel. This was attacked with a 12-in. rifle and Carpenter projectiles weighing 850 lbs., the gun being at a distance of 319 ft. from the plate. The first shot, with a striking velocity of 1,322 ft., penetrated 16.6 in. The second, with a velocity of 1,495 ft., went through the plate and 3 in. into the backing. The third shot, with a velocity of 1,558 ft., went completely through the plate, the backing and the bank. No cracks were developed and the plate was accepted, but like the Carnegie plate, won no premium.

The projectiles, both Holtzer and Carpenter, showed so little deformation that they could be used again.

#### Luminous Paints.

Speaking of luminous paints in the *Revue Scientifique*, M. Jacksh says that there are, in all, four sulphur compounds which, after exposure to daylight, become phosphorescent. These are the sulphates of calcium, of strontium, of barium and of zinc. The luminous variety of the zinc sulphate was not obtained until quite recently, by distillation in a vacuum. When prepared in the ordinary way, by precipitation from zinc salt solutions by means of sulphur compounds, or by dissolving zinc in sulphuric acid, zinc sulphate fails to show even a trace of phosphorescence. Sulphate of barium gives an orange glimmer in the dark, which, however, lasts only for a few minutes after each exposure to daylight. It is therefore of little practical value as compared with the sulphates of strontium and zinc, which emit a greenish light lasting about two hours. Even these, however, suffer in comparison with the sulphate of calcium. In a pure state this gives out a yellowish light. With a small quantity of some bismuth salt added and heated to redness, on the other hand, it gives out a violet light which will be maintained for about 40 hours, even though the mixture be originally exposed to daylight for only a few seconds. Speaking more specifically, M. Jacksh says that the calcium paint should be prepared by first dissolving 500 gms. of pure white gelatin in two litres of hot water. To this should be added 1 1/2 kg. of the calcium and bismuth salt mixture, and finally 50 gms. of glycerin. The liquid should be applied while hot, and should be kept well stirred. Two coats, it is said, will suffice in all cases.

#### Correction of Steel Tapes for Temperature.

The *Compass* shows an illustration of a steel tape which has numerous small divisions on either side of the 0 point, each division being equal to the expansion or contraction of the tape for five degrees of temperature. The 0 point of the tape is marked with the number of degrees (60) for which the tape is adjusted, and the other divisions are marked with reference to this number (90). The object of this graduation is readily seen. If one knows the temperature, when using the tape, he measures from that small division of the tape which corresponds with the number of degrees of his thermometer, thus adding or subtracting the correction for the shortening or lengthening of the tape in consequence of the change of temperature. The device is called "A Temperature Compensating Scale."

#### The Pintsch System in India.

The Government having called upon the agent and manager of the Madras Railway for a financial comparison between the present mode of lighting carriages on the Madras Railway and the proposed Pintsch gas-system, the agent has replied that there will probably be an annual saving of Rs. 5,000 by the introduction of the gas.

#### The Broadway Cable.

A telegraph cable is being drawn into the pipe already laid in a part of the conduit of the Broadway cable railroad in New York City. Preparations for establishing a means of communication from any point on the line to the power-house have been under way for some time, and the pipe for carrying the cable was put into the conduit some time before the accident of the 5th inst.

#### Information for Foreign Engineers.

The Committee on Information and Courtesy of the American Society of Civil Engineers has issued a map and other information for the benefit of foreign engineers who may visit this country during the summer. The map is a reference map of the United States, 20 x 29 in., very well engraved by Rand, McNally & Co., divided into rectangles by the latitude and longitude lines in red. The degrees are conspicuously printed in red on the margins. A list of characteristic works is given, with references by number to the co-ordinates of the map. This list cannot, in the nature of things, be exhaustive, but it is sufficient for a general guide. A preface gives the names and addresses of persons and organizations in different cities where further information and aid may be had. The Committee, which consists of Messrs. Edward P. North, L. L. Buck and Foster Crowell, has done a laborious and useful job.

#### A Midvale Tire Record.

The Midvale Steel Company has sent us a statement showing the mileage made by a set of Midvale tires on engine No. 47 of the Minneapolis & St. Louis. These tires for a net reduction, including brake wear, of 1/8 in. have made 203,207 miles, equal to 14,443 miles to 1/8 in. of wear. They were originally 5 in. thick, and as the Midvale Co. had never made any tires before as thick as these the officers were especially interested in seeing what they would do. The engine is a four-wheel type, and is used with driver brakes. Weight, 75,000 lbs.; weight on drivers, 50,000 lbs.; size of centre, 56 in. The roadbed on which the engine is running is in prime condition, sand ballasted, and has about one percent. average grade. The engine is running on through passenger trains, and has made nearly all this mileage while in charge of one engineer, Mr. Thomas.

#### The Gibbs Berth Light.

The Gibbs berth light is now in use on 21 sleeping cars of the Chicago, Milwaukee & St. Paul, and is giving ex-

cellent satisfaction. It is an incandescent electric light, placed in the middle of seats just above the shoulders, and is said to be unequalled to read by, being far superior to the high chandeliers in the centre of cars. It was illustrated in the *Railroad Gazette* of Feb. 7, 1890.

**The Intramural Railroad at Jackson Park.**  
The Intramural Railroad, a description of which appeared in the *Railroad Gazette* of May 19, is proving one of the chief attractions in the World's Fair grounds. Figures furnished by Mr. E. W. Baker, General Manager, show that during the month of June the number of passengers carried reached a total of 784,756. The number of trains on the road ranged from 7 to 12, and the total train-mileage amounts to 27,720. The trains run are of four cars and weigh 125,000 lbs. The amount of fuel oil used in June was 82,400 gallons, costing \$1,379.89, or slightly less than 0.18 of a cent per passenger. The largest number of passengers carried an hour on July 4th was 6,670, and the total number for the day was 63,117. The 12 trains at present in operation were moved the greater part of last week by a Williams vertical compound condensing engine of 1,000 rated horse power, driving one direct coupled 750 kilowatt generator. The average horse power required runs, somewhat above the rating of engine and dynamo, reaching at times as high as 1,200 or 1,500 H. P. Mr. B. J. Arnold, Consulting Engineer of the General Electric Company, will commence an exhaustive series of tests about Aug. 1, and will doubtless bring to light much interesting data on the cost of operation of large power plants.

#### THE SCRAP HEAP.

##### Notes.

A collision in the yard of the Pennsylvania, at Sunbury, Pa., July 6, set fire to an oil car and the resulting fire did \$50,000 damage.

A yardmaster and crew of the New York & New England, at Waterbury, Conn., struck last Tuesday on account of new rules issued by the trainmaster which increased their time of working.

The officials of New York City have withdrawn their objection to paying the city's share of the cost of the improvements in connection with the New York Central & Hudson River railroad in Park avenue.

The story has been started that the five-hour train from New York to Boston on the New York, New Haven & Hartford is to be discontinued. This is denied by the officers of the company, who state that the train has been well patronized.

George B. Richardson, a train wrecker, has been sentenced to eight years' imprisonment at Roseburg, Or. Train No. 1 of the International & Great Northern was held up near Neeches, Tex., July 6, and some money taken from the express car.

A trestle bridge on the Philadelphia, Reading & New England Railroad near Rhinecliff station was burned on the morning of July 8. It is supposed that the fire was set by a locomotive. This completely cuts off the terminus at the Hudson at Rhinecliff as well as the roundhouse and freight yard. The trestle was over 100 ft. long.

The Kansas judges who were imprisoned because they refused to order a tax to pay outstanding bonds of the Tebo & Neosho railroad have been liberated. They are to order an election Aug. 29, and if the voters do not sustain them they are to be returned to jail. It appears that the imprisonment of these judges is rather conventional.

Through traffic on the Great Northern to the Pacific coast was resumed on July 10. It had been interrupted for several days by the burning of a trestle bridge across a dry coulée, near Rock Island, Wash. The bridge is now being rebuilt, and during the interim a switchback, one and a half miles long, will be used. The bridge was 1,300 ft. in length.

On the night of July 8 a serious fire was started, as is supposed by lightning, in the yard of the New York, New Haven & Hartford at New Haven. Sixty-four freight cars were burned, 50 of which were foreign cars, and all of which were loaded. The estimated loss is between \$75,000 and \$100,000. One of the cars contained 36 cases of Winchester cartridges. The sheds and platforms burned were insured for \$5,000.

The Philadelphia Record says that the Pennsylvania road is to give its clerks a free excursion to the World's Fair, similar to that spoken of last week in connection with the New York Central. This refers apparently to the clerks in the general offices at Philadelphia, Jersey City and other important points. A New Orleans paper says that the Illinois Central will give its clerks two weeks' vacation and a pass to Chicago.

A reply has been made by Vice-President Voorhees, of the Reading, to the Grievance Committee of the employés of the Lehigh Valley Division, which submitted to the officers of the company, about six weeks ago, a list of grievances. The company declined to make any increase of wages, but will at once investigate the other grievances complained of. Forty switchmen in the yards of the Lake Shore at Cleveland struck last Saturday because a yard conductor had been suspended for slack discipline.

Press dispatches reporting reductions of expenses continue to be somewhat numerous. The Missouri Pa-

cific, which has several times been reported as retrenching, dismissed 100 men from the St. Louis shops and some traveling traffic agents last week, according to a St. Louis dispatch. The Atchison has made further discharges of men from the shops, and the Union Pacific discharged men at Omaha, July 3. On July 3 it was reported that all passenger trains had been taken off the Savannah, Americus & Montgomery road, passenger cars being attached to the freight trains for all business.

##### Lake Notes.

Canal freight on wheat is 3½ cents. The average has not been above 2.7 cents since 1887, when it was 4.1 cents.

The closing of iron mines is throwing so much shipping into the grain trade that freight from Duluth to Buffalo for wheat is down to 1½ cents, and coal freight back is 30 cents. Last year the lowest price for wheat was 2 cents, and the highest 5; while coal freights ranged from 30 to 35 cents, except at the close of the season, when they went up to 50. Wheat rates, however, touched 1½ cents in 1891.

A great deal of Chicago wheat is going by the way of Kingston and Montreal on through contracts, and charges are made that the Welland Canal tolls are being refunded to vessel owners. It will be remembered that after some negotiations following the impositions of tolls on Canadian vessels passing through the "Soo" canal the Dominion Government reduced the tolls on the Welland Canal from 20 to 10 cents per ton, and agreed to give no drawbacks to vessels discharging at Canadian ports. It is claimed that the drawback, which amounts to about one-third of a cent per bushel, is paid by other parties than the government.

Mr. Collingwood Schrieber, the Chief Engineer of the Dominion Railroads & Canals, has gone to the Soo to make arrangements for the final contracts for completing the Canadian lock and canal. These are mainly for a swing bridge over the canal and the lock gates. The masonry yet to be done amounts to above 70,000 cu. yds., and at the rate the contractors, Messrs. Hugh Ryan & Co., are laying it, viz., 5,000 to 6,000 yds. a day, it is thought it will be finished this summer. It is proposed to work the lock gates by electricity, as the fall, 16 ft., will give ample power.

Of the 20-ft. channel Gen. O. M. Poe says that on all but one or two sections work is progressing satisfactorily. Although this is a big job of dredging, which was taken by the several contractors at a cost scarcely more than half what was expected, the results of two months' work have justified the belief that it will be completed within the short time allotted to the contractors.

General Poe's report on the St. Mary's Falls Canal for the year ending June 30 is as follows:

Items.	Fiscal year.	Increase.
	1892.	1893. Percent.
Vessels.	11,557	12,160 5
Lockages.	5,616	5,611
Tonnage, registered, net.	9,828,874	10,225,971 4
Tonnage, freight, net.	10,107,603	10,545,404 7
Passengers.	25,697	23,919
Cattle, net tons.	2,717,029	2,771,667 2
Flour, barrels.	4,184,612	5,627,778 34
Wheat, bushels.	4,496,240	40,950,000
Groceries, other than wheat, bus.	952,891	2,446,159 157
Metals and pig iron, net tons.	73,017	97,291 33
Salt, barrels.	236,169	251,028 6
Copper, net tons.	6,597	73,006 12
Iron ore, net tons.	4,142,797	4,600,797 13
Lumber, per M.	399,985	620,531 55
Silver ore, net tons.	1,330	1,365 47
Building stone.	38,778	47,176 22
Unclassified freight.	443,212	371,359

The total freight exceeds that of any previous fiscal year by 738,801 tons. The average time in making a lockage was 41 minutes and 33 seconds.

##### Foreign Notes.

Plans for electric street lighting at Munich, Germany, have been worked out which, it is stated, will give that city a lighting system equalled only by that of Milan, Italy, among all the cities of continental Europe. Water power will be used to generate the current, and the contract for the work has been awarded to the German electric firm of Schuckert & Co., of Nuremberg. Besides the street lighting plant there will be an electric accumulator plant for illuminating the municipal buildings.

A "magnetic screen," constructed for the purpose of protecting some delicate laboratory instruments from the magnetic influence of a large dynamo situated at a distance of about 50 ft. from them, is described in *Nature*. The walls of the room containing the dynamos were built of brick and were made double with an intervening space about 6 in. wide, which was filled with scrap iron. Delicate tests, subsequently instituted, showed that this arrangement completely protected the instruments in question from all disturbing influences from the dynamo.

An interesting piece of ordnance has recently been completed at the French gun foundry at Ruelle. It is a 16 c. m. (6 4 in.) gun having a length of 90 calibres, or about 48 ft., and its novelty consists in the fact that the tube is made up of four independent pieces which can be screwed together so that its length can be varied from 8 metres (about 30 ft.) to the full 48 ft. The gun is an experimental one and was designed specially to determine the best means of using the new smokeless powder. Experiments are to be carried out with it at Arvens, some preliminary tests having already been conducted.

Telephone statistics have been gathered by the *Journal Télégraphique* from 13 different countries comprising a population of about 200,000,000 inhabitants. From the published figures it appears that in these countries there were, at the end of 1892, 1,901 localities having telephone service. The number of stations amounted to 363,512, and the number of conversations carried on during the year figured up 800,754,467. On an average there was one subscriber in every 600 inhabitants, and one telephone system for every 100,000 people. The average daily number of conversations carried on by each subscriber was seven.

In a recent issue the *Schweizerische Bauzeitung* publishes a communication from a Swiss engineer now residing in the United States, giving particulars of the locomotive No. 999 of the New York Central road, and also of the fast runs made by this engine in connection with the famous "Empire State Express" train. The *Bauzeitung* refers to the communication with special satisfaction, as even more than bearing out some of its recent statements concerning high train speeds reached

in the United States, which appear to have been looked upon abroad with a good deal of incredulity, and as acceptable only with a liberal discount for Yankee boasting. Our contemporary's correspondent, being personally known to it as reliable and trustworthy, has now seemingly removed much of the doubt as to the correctness of the published figures. The speeds attained by the "Empire State Express" exceed those of the trains originally referred to in the *Bauzeitung*; and had the information concerning them come from any other source, says the journal in question, it would have seemed scarcely credible.

A new electric insulating material called "stabilit" has been brought out by the Allgemeine Elektricitäts Gesellschaft, of Berlin, Germany. It is furnished in the form of sheets, rods or tubes just like ebonite, for example, and can be given a reddish or gray color as desired. Like ebonite or vulcanized fibre, also, it can be worked by ordinary cutting tools, and even admits of being highly polished. It would seem to be specially well adapted as a substitute for slate and marble for switchboard use, being non-hygrosopic, besides having good non conducting properties. It is said to be unaffected by hydrochloric and sulphuric acids or by alkalies, and, by comparative tests, to have shown itself superior to either ebonite or vulcanized fibre in point of durability. When boiled in water for a period of 12 hours the stabilit, according to a foreign exchange, remained unharmed. The fibre and the ebonite, similarly treated, became quite soft. In a bath of paraffin, at a temperature of 200 deg. C., the fibre became brittle, and at 250 deg. C. commenced to carbonize; ebonite became soft; but in the use of stabilit no change was observed. The density of the new material is 1.6.

##### South American Notes.

The Lanus Railway concession, for a road through the Gran Chaco, Argentine, has been rescinded. A London corporation had purchased the concession for \$100,000, but had failed to begin construction within the specified time.

About a dozen engineers sent out by Puchard, McTaggart, Lowther & Co. arrived in Puerto, Colombia, on May 19, en route for Bogota, where they will make a survey of a proposed line to be known as the Meta Railroad, from Bogota to the head of navigation on the River Orinoco.

The mole in construction by the Bolivar R. R. Co. at Savannia, Colombia, is practically completed, and will be ready for use in a few days. It is 4,060 ft. long and cost £100,000. The Bolivar Railroad will renew its rolling stock (old style German make) with new goods of American manufacture.

The report of the directors of the North Western of Uruguay Railway Co. shows a gross revenue for 1892 of \$162,240, being a decrease over the preceding year of \$585. The expenses amounted to \$141,735, being an increase of \$1,330. The road is endeavoring to increase traffic by colonization along its line. To this end a land and development company has been organized. Each family settling on its lands receives \$250 in cash.

The Autofágasta & Bolivia Railroad, from Autofágasta, Chile, to Oruro, Bolivia, a distance of 574 miles, turned in a gross revenue of \$3,778,503 for the year 1892. This is a gain of \$368,884 over 1891, which gain is from general patronage, the receipts from carrying the company's construction materials having been only half as much as in the previous year. The line has been in operation to Oruro regularly since April 1, 1893.

The net earnings of the Amazon Steam Navigation Co. for 1892, after deducting costs of repairs to plant and the value of one steamer "Colibri," wrecked in the Rio Purus, amounted to \$190,950. Out of this the company has declared dividends of 7 per cent. for the year. The contracts with the government of Brazil expired in October last. The company is now negotiating for their renewal. Meanwhile competing companies have tendered bids for the contracts.

The Buenos Ayres & Pacific Railroad, Argentine, enjoyed a far more prosperous traffic in 1892 than in 1891, according to official reports. The gross receipts were \$3,185,097. Argentine money, while expenses amounted to \$2,470,616, leaving a net profit of \$714,480, representing an increase of 97.05 per cent. over the preceding year. The increase in passenger traffic was 8.60 per cent., and in freight traffic 16.09 per cent. The receipts per train mile were \$3.88, as against \$3.53, and the expenses \$3.01, as against \$3.00 for 1892 and 1891 respectively.

The Santander Railway, Colombia, from Puerto Witches, on the Magdalena River, will extend to Bucaramanga, capital of the State of Santander. This road is under contract by the government to Puchard, McTaggart, Lowther & Co., of London, and construction will begin immediately. It is one metre gauge, with 3 per cent. compensated maximum grade, except 4 kilometres of Abt rail 7 per cent. grade, and will be laid with 45 lb. rails, and stocked with American style rolling stock. Señor Abelardo Ramos, Chief Engineer, is in charge for the contractors. The government representative is not yet appointed. Five and a half years is the period fixed for the completion of this line.

The report of the Paulista Railroad Co., of Brazil, states that the freight traffic on its system amounted to 513,671 tons in 1892, against 403,910 tons in 1891. The number of passengers carried was 847,799 in 1892, and 543,754 in 1891. Surveys for the extension of the line to the seaboard at São Sebastião, have been completed, and show no engineering difficulties in crossing the coast range to the interior of the State of São Paulo. The Mogiyan Railroad transported 171,436 tons of freight in 1892, against 152,028 tons in 1891. The increase of receipts in both lines was very considerable in 1892, but the enormous price of coal, due to the block at Santos, enlarged the operating expenses disproportionately. The cost of coal increased from 36 mil reis to 79 mil reis within the year. The value of the mil reis has fluctuated between 20 cents and 22 cents during that period.

The old squabble between the Argentine Government and the guaranteed railroads has acquired fresh vigor through the refusal of the Railroad board to approve the payment of guaranteed interest to the Central Northern (Córdoba to Tucuman) Railroad until that company has paid over to the government 45 per cent. of its gross receipts. This line was sold by the government in 1887 to a private corporation for \$16,000,000 gold, and the government guaranteed five per cent. on the purchase money for 20 years, upon the understanding that the working expenses were to be taken as 55 per cent. of the gross income. In this requirement the Central Northern stands on the same basis as the majority of the guaranteed lines. The expenses have in nearly all cases consumed almost the entire gross revenue, and the lines have failed to cover into the national treasury any portion of their receipts. The government on the

other hand has withheld the guaranteed interest. The railroads accuse the government of dishonesty and unfairness, and the government repays the compliment cordially.

#### Around the World in 62 Days.

In the Canadian Pacific ticket office window, 129 St. James street, Montreal, is to be seen a part of an envelope which went around the world by the Canadian Pacific route in 62 days. The letter was registered in London, April 7, and left there 8 p. m. that date. It reached Hong Kong 8:30 p. m. on May 1, via Suez. It was sent forward the following day on one of the "Empress" steamers of the Canadian Pacific and arrived back in London on June 8, 1893.

#### New Fast Trains in Germany.

Concerning the new fast trains which have been put in service within the past few weeks on the lines between Berlin and Cologne, and Berlin and Frankfort-on-the-Main, in Germany, and to which reference has previously been made in the *Railroad Gazette*, the following additional particulars are given in the German papers: Provisions have been made for running 24 of these trains which, in the main, are made up after American models. The cars are vestibuled, measure about 53 ft. in length, and each has two washrooms. The rear end of the last car of each train contains a kitchen and buffet, and gas is used for cooking as well as lighting. Each train is accompanied by a porter, and electric call bells are provided for those desiring his services. The cars have special ladies' and smokers' compartments, and each compartment is fitted up with folding tables. There are, in all, 126 numbered seats in each train, which can be reserved half an hour before the time of starting by paying an extra fee of one mark, or about 25 cents. For seats so reserved special seat tickets are issued which must be shown to the conductor together with the regular ticket. Each of the trains is made up of five cars, this number being increased to six whenever the traffic warrants it.

#### Graphite Exhibit at Chicago.

The Joseph Dixon Crucible Co. is the only concern in the world which manufactures every article of which graphite is a component part. With the invention by Joseph Dixon, in 1827, of the plumbago crucible began the development of an industry now grown to very great proportions in the business of the Joseph Dixon Crucible Co.

This company has two exhibits at the World's Fair. One is of Dixon's American graphite pencils, in the northeast gallery of the Manufactures Building, and the other, covering all the other articles manufactured by the company, in the northeast gallery of the Mines and Mining Building. The pencil exhibit occupies a space  $10 \times 14$  ft. In the centre of this space stands a low mahogany table surmounted by a pyramid of velvet which is covered with pencils arranged in neat designs. Over this pyramid stands a rosewood and plate-glass case. This space is lighted at night by means of two gilt electroliers of six 16-C. P. lights each.

The company's exhibit of general and special graphite products in the Mines and Mining Building occupies a space  $25 \times 28$  ft. Crucibles, retorts, ladles, stopper-heads and nozzles, graphite boxes, phosphorus chargers, resistance rods and devices, incandescent filament forms and other special goods made of graphite are shown in upright cabinets. In another case is shown the development of an electrotype plate, in which process the use of graphite is an essential. In still another case are shown over fifty varieties of graphite, for as many different uses and under as many different names, such as graphite for lubricating, stove polish, foundry facings for green, dry or loan castings, core wash, ingot mold wash, shot and powder glazing, electrotypers', gilders' use, rubber packings, piano and organ actions, "pot-leading" yachts, for crucibles, lead pencils, paint pigment, lubricants, etc., etc.

There are also shown samples of graphite from all the principal sources from which that article is obtained. One very fine sample from the island of Ceylon weighs nearly 300 lbs.

#### Fire-Sitting in Norway.

All who have investigated the early methods of mining know that before the introduction of gunpowder drifts were driven by "fire-sitting," but probably only a few know that this method of driving levels is still in occasional use at the Kongsberg silver mine in Norway. The method, as described by Mr. A. L. Collins in a paper read before the Federated Institute of Mining Engineers, is, first, to drive the level in the ordinary manner so as to get room for a start; then wood—mainly logs of white fir and red pine, dry and split—is closely piled up so that the fire plays against the "face"; waste wood or old timbers from the mine being often piled against the freer-burning fir, to concentrate the heat. When the pile is lit smoke fills the level, and the men leave it, but in two or three hours it is generally burnt out, and as soon as the men can come in the broken stone which is split off is cleared away, and all that is sufficiently loose is broken down. The speed of driving in hard siliceous gneiss—the process does not work well in mica schist—varies from 5 to 20 ft. per month. Up to 1864 fire-sitting was both cheaper and quicker than the old method of blasting with black powder in large holes, but on the introduction of dynamite, which permitted drilling small holes, the relative economy was reversed, as the small holes cost less for labor, and the cost of fire-sitting was greater owing to an increase in the cost of labor. With proper upcast and downcast shafts fire-sitting is an aid to ventilation.

#### The "Henry F. Shaw."

The locomotive "Henry F. Shaw," which William E. Lockwood built several years ago to illustrate certain of his ideas in mechanics, is now in regular passenger service, having been purchased by the Philadelphia, Sea Isle & Cape May Railroad. This engine was built to "demonstrate the hammer blow" and to correct its evils. It has a special device for the prevention of smoke and sparks.

#### A Railroad from Valencia to Madrid.

A pamphlet has just been issued by Don Juan Isla Doménech, relating to an important railroad line for which a concession was granted to him by the Spanish government in 1892. This line is to connect the city of Valencia with Madrid, a distance of 224 miles. The estimated cost of the road is \$8,250,000, or \$36,830 a mile. This estimated cost will be reduced by liberal grants of land for right of way, stations, yards, etc., by the various provinces and municipalities along the route, already tendered the company. The estimated traffic which will use this road is 571 passengers a day, and 94,000 tons of freight a year. The work of construction has already

commenced, 11½ miles being completed. The route traverses a rich agricultural country, susceptible of important development. This will also be the shortest road from Madrid to the seacoast, so that the Valencians hope for a large growth of trade from becoming the port of that inland city. The company proposes to run trains from Valencia to Madrid in eight hours. The line will be double-tracked throughout, and will be equipped with high-class rolling stock, including palaces.

#### How a Contemporary Takes It.

Our old friend *Iron* is no more, the paper having been acquired by the celebrated Mr. Pearson, of Missing-Word Competition fame. Mr. Pearson has also taken over *Industries*, a weekly technical publication, and both papers are incorporated in one as *Industries and Iron*. The new paper is published in a "marble palace" recently erected in Henrietta street by Mr. Pearson. We presume Mr. Pearson made a fortune out of the missing-word competitions, and we trust he will make another out of *Industries and Iron*.—*Iron & Steel Trades Journal*.

#### The Loss of the Victoria.

The London *Times* has compiled the following table showing the most important losses of British warships in the last 30 years, which is of peculiar interest since the recent terrible disaster to the "Victoria."

Ships.	Where lost.	When lost.	No. of lives lost.
Orpheus.	Off Manukau.	Feb. 5, 1863.	190
Racehorse.	Off Chetoo.	Nov. 4, 1864.	99
Bombay.	River Plate.	Dec. 14, 1864.	91
Slaney.	Paracels.	May 9, 1870.	about 40
Captain.	Off Finisterre.	Sept. 7, 1870.	472
Eurydice.	Off Isle of Wight.	March 24, 1873.	318
Atalanta.	Atlantic.	March, 1880.	280
Wasp.	Tory Island.	Sept. 22, 1884.	52
Wasp.	China Seas.	September, 1887.	73
Lily.	Labrador.	Sept. 16, 1889.	7
Serpent.	N. W. Spain.	Nov. 10, 1890.	173
Victoria.	Off Tripoli.	June 22, 1893.	360

Among naval catastrophes of the century, which, so far as loss of life is concerned, rank with the founding of the "Victoria," are the wreck of the "Birkenhead" (436 lives lost) in 1852; of the "St. George" (731); "Defence" (587), and "Hero" (590), in 1811; of the "Minotaur" (400), in 1810; of the "Blenheim" (500), in 1807; of the "York" (491), in 1806; and of the "Invincible" (464), in 1801. These and the founding of the "Captain" are, we believe, the only cases comparable with the loss of the "Victoria." It may be worth while adding that with the "Royal George," which, while being careened at Spithead, over-set and founder in 1782, there were lost upwards of 600 in addition to Rear-Admiral Kempenfelt, officers, men, and visitors; and that earlier in the last century the founding of the "Victory" involved the sacrifice of upwards of 1,000 souls, an unusually large proportion of midshipmen.

#### LOCOMOTIVE BUILDING.

The trustees of the New York & Brooklyn Bridge have decided to invite competition for the new switching locomotives for the bridge.

#### BRIDGE BUILDING.

Alviston, Ont.—The contract for the new steel bridge to be built over the Sydenham River at Alviston, Ont., for \$6,300. The contract calls for its completion by Oct. 15.

Arnprior, Ont.—The iron work for the Ottawa, Arnprior & Parry Sound Railroad bridge across the Madawaska River has all been completed, and will arrive at Arnprior this week. The contractors expect to commence work putting the bridge together at once. The Dominion Bridge Co., of Montreal, has the contract.

Bridgeport, Ont.—The Waterloo Township Council has accepted the tender of the Central Bridge & Engineering Co., of Peterborough, for a steel bridge with steel joists, to be built across the Grand River at this place. The contract price is \$3,965.

Columbus, O.—The Penn Bridge Co., of Beaver Falls, Pa., has the contract for building a new bridge on Front street, over the Little Miami railroad tracks. Material for the structure is to be shipped in 45 days. One girder is to be 117 ft. long.

Dayton, O.—Hoist bridges are to be erected over the canal at First street and at Main street. Proposals were invited last week by the Board of City Affairs, but none were received, and another invitation will be issued. One bid for \$13,000, by the Rogers Iron Co., was received for the construction of the Second street bridge over the canal.

Bids for the proposed single-span Pratt truss bridge over Alum Creek, are to be received by the County Auditor up to July 24. The span is to be 140 ft., truss, 22 ft. high; roadway, 18 ft. in the clear, with steel joists.

Delaware County, Pa.—The contract for a new bridge to be erected over Cobb's Creek, on Baltimore avenue, between Philadelphia and Delaware counties, has been awarded. The cost is to be borne by both counties. It will be \$14,395.

Everett, Pa.—James B. Fluck will build the superstructure for the single span 90-ft. bridge across Yellow Creek in Hopewell township at his bid of \$924. W. Wolf was awarded the contract for superstructure of a bridge across Scrub Grass in King township of one span of 50 ft. for \$570. Cook, Fleagle & Shoemaker, of Hyndman, were awarded the contract for the masonry of a bridge to span Will's Creek near Hyndman. This is to be an iron or steel bridge, and the contract for the superstructure will soon be let.

Florence, Ala.—The contract for the approaches of the new Memphis & Charleston Railroad bridge across the Tennessee River at this point has been let to the Detroit Iron Bridge Co., of Detroit. This company has just completed the bridge proper, which is one of the largest bridges in the South.

Malvern, Pa.—After considerable delay the Pennsylvania will resume work on the new bridge at this point. The stone work is completed and the iron for the balance of the structure is on the ground.

Meaford, Ont.—The Bridge Committee and the Mayor have been appointed to make arrangements to rebuild the bridge at this place.

New Haven, Conn.—The contract for building the new Washington bridge over the Housatonic River has been awarded by the commissioners of New Haven and Fairfield counties to Dean & Westbrook, of New York, for \$88,900.

Niagara Falls, Ont.—The Cataract Loan Co., of Niagara Falls, is being incorporated with a capital stock of \$50,000 to purchase lands, erect bridges, etc., W. L. Doran is one of the incorporators.

Paisley, Ont.—The County Council has granted the sum of \$5,500 for the construction of Rae's Bridge near this town.

Peterborough, Ont.—The city council, at a meeting held recently, granted the sum of \$1,000 toward the construction of a new iron bridge, with stone abutments, over the river Westwood, at Westwood, in the township of Asphodel, and the sum of \$2,000 toward the reconstruction of the Smith Street Bridge.

Regina, N. W. T.—The Government has employed John Reid, C. E., to prepare plans and specifications for two bridges on the Devil's Lake, or North Road, one across Cussit Creek, and the other across White Sand.

Sarnia, Ont.—The county council has granted the sum of \$1,100 toward the erection of an iron or steel bridge at Grand Bend.

Spokane, Wash.—The board of public works has awarded the contract for the Post Street Bridge to the San Francisco Bridge Co., for \$13,950. Seven firms made bids, submitting their own plans. The advertisement called for proposals on a steel bridge 240 ft. long with 160 ft. approaches. The estimated cost was \$15,000. The bids were as follows: California Bridge Co., \$19,000; Toledo, seven plans, \$15,000 to \$19,310; Butler, four plans, \$13,989 to \$16,489; Pacific, \$15,820; Western, \$14,488; Bayley, \$14,368 and \$14,116; San Francisco, \$13,950 and \$13,300.

Tacoma, Wash.—The plans and specifications for the Eleventh Street Bridge are now being prepared by City Engineer Morrison and will probably be ready for receiving bids within a few days. The permission of the War Department has yet to be obtained. The spans over the railroad tracks will be two—60 ft. each. The west approach will be 340 ft. and the east approach will be on piles. The channel will be crossed by two fixed spans of about 185 ft. each, with a draw span of 250 ft.

The board of public works is sending out specifications for the construction of the Fifteenth Street Bridge. The bids must be in Aug. 5.

Wakertown, Ont.—Geo. Gould, Town Clerk, is receiving tenders for the erection of a steel bridge over the Saugeen River on Durham street. Length, 165 ft.; roadway, 16 ft. clear; one sidewalk, 5 ft. clear.

WindSOR, Ont.—The plans for a new bridge over the Michigan Central Railroad on Sandhill street are being prepared. The cost will be about \$15,000.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Berkshire, quarterly, 1½ per cent., payable July 15.

Boston & Maine, quarterly, 2 per cent., payable Aug. 15.

Long Island, quarterly, 1¼ per cent., payable Aug. 1.

Louisville & Nashville, semi-annual, 2 per cent., payable Aug. 1.

Mahoning Coal, semi-annual, 3 per cent., payable Aug. 1.

Mine Hill & Schuylkill Haven, semi-annual, \$2 per share, payable July 15.

Stockbridge & Pittsfield, quarterly, 1½ per cent., payable July 15.

##### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Marquette, Houghton & Ontonagon, annual, Marquette, Mich., July 20.

Old Colony, special, Boston, Mass., July 18.

##### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Association of General Passengers and Ticket Agents will hold its next annual convention in Milwaukee, Wis., Sep. 19.

The Railway Freight Claim Association will hold its next annual convention at the Hotel Cadillac, Detroit, Mich., Aug. 9.

The American Association of General Baggage Agents will hold its annual convention in Chicago, July 19.

The World's Congress of Engineers in connection with the World's Fair will hold meetings in Chicago in the week commencing Monday, July 31.

The American Society of Civil Engineers will hold its summer convention in Chicago, in connection with the World's Congress of Engineers.

The New England Roadmasters' Association will hold its annual convention in Boston, Mass., Aug. 19.

The American Society of Mechanical Engineers will hold its summer meeting in Chicago, commencing July 31.

The Roadmasters' Association of America will hold its next annual convention in Chicago in October.

The Western Railway Club meets in room 730, The Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The New York Railroad Club meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The Northwest Railroad Club meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except during June, July and August, at 8 p. m.

The American Society of Civil Engineers meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The Boston Society of Civil Engineers meets at Westley Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The Western Society of Engineers meets at 78 LaSalle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The Engineers' Club of St. Louis meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The Engineers' Club of Philadelphia meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The Engineers' Society of Western Pennsylvania meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The Civil Engineers' Club of Cleveland meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The Engineers' Club of Cincinnati meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the South meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The Denver Society of Civil Engineers meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The Montana Society of Civil Engineers meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The Engineers' Club of Minneapolis meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The Canadian Society of Civil Engineers meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday except during the months of June, July, August and September.

The Technical Society of the Pacific Coast meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The Tacoma Society of Civil Engineers and Architects meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The Association of Engineers of Virginia holds informal meetings the third Wednesday of each month, from September to May inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

#### American Society of Civil Engineers.

Although there was no meeting of the Society on July 5, ballot list No. 7 was canvassed by the tellers, who had been previously appointed, and the following gentlemen were elected members: William W. Follett, Denver, Col.; John Fritz, Bethlehem, Pa.; John Edwards McKay, Assistant Engineer Croton Aqueduct, New York City; Emery Washburn Munscher, Chief Engineer Manistee & Grand Rapids Railroad, Manistee, Mich.; Eben Erskine Olcott, New York City; John Patrick O'Donnell, Signal Engineer, London, Eng., Associate Member; Francis Henry Bainbridge, Principal Assistant Engineer, Edge Moor Bridge Works, Wilmington, Del.

#### Engineers' Society of Western Pennsylvania.

A regular meeting of the Society was held on June 20, M. J. Becker, President, in the chair. Four applicants were elected to membership. Two important papers were read and ordered printed for discussion at the September meeting, *et cetera*:

"Gas and Gas Producers," by Walter E. Koch, and "The Effects of Suddenly Applied Loads Upon the Tensile Strength and Other Physical Properties of Wrought Iron and Steel," by E. D. Estrada.

#### Chemical Section.

At the meeting on June 27 Mr. James O. Handy read a paper on "Moisture Determination in Dynamite," and one on "Notes on Phosphorus Determination." Prof. F. C. Phillips spoke of the use of natural gas in many chemical processes. Mr. R. B. Carnahan, Jr., described rapid precipitation by passing air instead of shaking. He also related instances of failure in phosphorus determination in pig iron, which were apparently due to the incomplete action of permanganate of potassium or to the precipitation of silica with the molybdate.

#### PERSONAL.

—Col. J. B. Wright, Division Superintendent of the Southern Pacific, with headquarters at Sacramento, Cal., has resigned.

—Mr. E. K. Morris, formerly Assistant Train Master on the Central of New Jersey, has been recently appointed Division Superintendent on the Long Island road.

—Mr. J. W. Peters, in addition to his duties as Superintendent of the Portland & Rochester road in Maine, has been appointed General Ticket Agent, vice Mr. C. L. Wiggin, resigned.

—Mr. Robert Walker, formerly Superintendent of the Car Department of the Missouri, Kansas & Texas, is suffering from a recent stroke of paralysis, and his condition is now reported to be critical.

—Mr. Charles Hansel, formerly engineer of the Illinois Railway & Warehouse Commission and more recently Chief Engineer of the Wuerpel Switch & Signal Co., of St. Louis, has resigned the latter position.

—The engagement is announced through the newspapers of President Roswell Miller, of the Chicago, Milwaukee & St. Paul, to Miss Mary E. Roberts, a daughter of a Presbyterian clergyman of New York City.

—Mr. Joseph York, the veteran locomotive engineer whose name has been previously mentioned in connection with the Baltimore & Ohio exhibit at the World's Fair, died at Meadville, Pa., on July 5. He was about 90 years old.

—Mr. Charles H. Hogan has been appointed Traveling Engineer of the Western Division of the New York Central & Hudson River. As a locomotive engineer he had one of the runs on "The Empire State Express" since that train was first put on.

—Mr. R. C. Monk, Manager of the creosote works of the Southern Pacific, located at Oakland, Cal., is inspecting the methods employed in creosoting timbers in other states than California, and has recently visited the creosoting works of the Southern Pacific in Houston, Tex.

—Mr. A. A. Bradeen, Master Mechanic of the Lake Shore & Michigan Southern shops in Norwalk, O., has been promoted to be Master Mechanic of the Lake Shore shops at Cleveland. E. E. Elden has been promoted

from the Elkhart shops to succeed Mr. Bradeen at Norwalk.

—Mr. E. V. H. Carpenter, General Freight and Passenger Agent of the Eastern Railroad of Minnesota, has resigned on account of ill health. No successor will be appointed and Mr. P. H. Rockwell, Assistant General Freight and Passenger Agent, will discharge the duties of the office.

—Mr. W. C. De Armond, formerly Purchasing Agent for the Norfolk & Western, has become the General Sales Agent of the Trojan Car Coupler Co., of Troy, N. Y., in place of Mr. T. F. De Garmo. The New York offices of the company have been changed from 11 Pine street to 49 Wall street.

—Mr. O. C. Greene, Superintendent of Telegraph of the Northern Pacific, was elected Second Vice-President of the Association of Railway Telegraph Superintendents at the recent convention at Milwaukee, and not Mr. G. M. Dugan, as stated in our report of the meeting published on June 30.

—General Manager W. F. Hallstead, of the Delaware, Lackawanna & Western, met with a narrow escape from a serious accident at New Milford, Pa., on Thursday a week ago. His special car collided with a gravel train and was derailed. Mr. Hallstead jumped from the car and was unhurt.

—Mr. A. T. Drew has been appointed Assistant General Freight Agent of the Missouri, Kansas & Texas, the office of General Traffic Claim Agent, Mr. Drew's former title, having been abolished. He will have charge of traffic claim adjustments, and the issuance of tariffs and divisions.

—Mr. F. H. Dowle, Chief Clerk of the Commercial Express Line, has been made Acting Manager of the line to fill the place of the late Mr. James Moore. Mr. Dowle has been in the fast freight lines for 30 years, the last five as Chief Clerk and Accountant of the Commercial Express Line at Buffalo.

—Mr. H. Walter Webb, Third Vice-President of the New York Central & Hudson River road, returned to New York this week after a month's vacation which he spent in Devonshire and Cornwall, in England. President Depew will probably leave in a few days for his usual summer trip to Europe.

—Mr. B. Haskell has been appointed Superintendent of Motive Power of the Chicago & West Michigan, the appointment taking effect on Aug. 1 next. This office has been vacant since the resignation of Mr. W. K. Morris, early last May. Mr. Haskell is now Master Mechanic of the Rocky Mountain Division of the Northern Pacific.

—Mr. W. J. Craig has resigned his office as General Freight and Passenger Agent of the Port Royal & Augusta road, which is now operated independently of the Central of Georgia by its own Receiver, J. H. Averill. Mr. Craig retains the same office on the Port Royal & Western Carolina, which is still operated by the Central of Georgia.

—Mr. Charles Potter, formerly Supervisor of the Chicago division of the Cleveland, Cincinnati, Chicago & St. Paul, has been appointed Roadmaster of the St. Louis division of the St. Louis, Iron Mountain & Southern, by General Superintendent Peck, who formerly held a similar position on the "Big Four." He succeeds Mr. D. Hurley, resigned.

—Mr. Frederick B. Miles, of Philadelphia, met with a terrible disaster at his summer cottage at Bay Head, N. J., on Saturday, July 8. His wife, with two children and three servants, were poisoned by impure food while he was absent in Philadelphia. Mrs. Miles died on Sunday morning, one servant has since died, and the others are in a critical condition.

—Mr. A. B. Liggett, until recently with the Union Pacific, but formerly under Mr. W. B. Doddridge, when he was General Manager of the St. Louis Southwestern, has been selected to succeed J. W. Dickinson, who retired from the superintendency of the Texas division of the "Cotton Belt" on July 1, as already announced. Mr. Dickinson has accepted a position with the Chicago, Rock Island & Pacific in Texas.

—Mr. T. A. Laws has been appointed Mechanical Engineer of the Cleveland, Cincinnati, Chicago & St. Louis. Mr. Laws was formerly Master Mechanic of the Chicago & Erie at Huntington, Ind., resigning about Aug. 15, 1892, to take position as Mechanical Engineer of firm in Detroit. He was Chief Draftsman of the "Bee Line," at Cleveland, O., in 1884, and afterward Master Mechanic of the Brightwood shops of the "Big Four." He resigned after Mr. Turrell left the service of the company.

—It is generally understood that at an early date the Reorganization Committee of the Richmond Terminal will take steps to secure the appointment of Mr. Samuel Spencer as co-receiver. The assent of the securities covering the Terminal system to the plan of reorganization has been so general that no opposition is expected to Mr. Spencer's appointment. His resignation from the New York Rapid Transit Commission is understood to have been preliminary to his acceptance of the position of receiver.

—Mr. C. J. Pickering, who, as reported last week, has been appointed General Freight Agent of the Texas lines of the St. Louis Southwestern, is at present Division Freight Agent of the company at Little Rock, Ark. Mr. Pickering has been with the St. Louis Southwestern about two years, at first as Commercial Agent, and was previously with the Missouri, Kansas & Texas, also about two years, when Mr. A. S. Dodge, now Traffic Manager of the "Cotton Belt," was General Freight Agent of the road.

—Capt. J. W. Simmons, for the past four years Superintendent of the Cairo, Vincennes & Chicago road, died last week at Niles, Mich. Captain Simmons began railroad work after the civil war, and filled positions as fireman, engineer, conductor, roadmaster, trainmaster and roadforeman of engines on the "Pan Handle," trainmaster and supervisor on the Columbus & Cincinnati Midland, and subsequently Superintendent of the above road, becoming Division Superintendent of the Cleveland Cincinnati, Chicago, & St. Louis, when that company secured control of the smaller line.

—President M. E. Ingalls, of the Cleveland, Cincinnati, Chicago & St. Louis, has recently returned to Cincinnati from an Eastern trip, and for the next few months will give personal attention to the management of the system, in the absence of Vice-President Oscar G. Murray, who is now in London. Mr. Murray was

accompanied abroad by Mr. W. P. Walker, Jr., Freight Traffic Manager of the Chesapeake & Ohio. The chief business which takes these officers to Europe is to discuss, with the English directors, matters affecting the management of the Chesapeake & Ohio Steamship Line which operates between Newport News and Liverpool.

—The appointment of Mr. A. S. Dodge as General Traffic Manager of the St. Louis Southwestern (Cotton Belt) gives him jurisdiction of both freight and passenger departments. The promotion is conceded to be the natural reward of faithful service. Mr. Dodge began his service with the Cotton Belt in 1881. Six years later he resigned and accepted a position on the Kansas City, Wyandotte & Northwestern, leaving that road in 1888 and going to the Missouri, Kansas & Texas as General Freight Agent. He returned to the Cotton Belt in April, 1892, under the administration of Mr. Doddridge as General Manager, and became Freight Traffic Manager. Mr. Dodge was recently offered the chairmanship of the Southwestern Railway & Steamship Association, but declined.

#### ELECTIONS AND APPOINTMENTS.

*Birmingham, Sheffield & Tennessee River.*—E. A. Hopkins is now Receiver of this road, with office at Sheffield, Ala.

*Canada Southern Line.*—Francis E. P. Ward has been appointed Agent of the Canada Southern fast freight line at Philadelphia, Pa., vice W. B. Hoyt, resigned.

*Central of New Jersey.*—Joseph T. Olhausen, formerly Traveling Car Agent for this company, has been appointed Assistant Train Master, New Jersey Central Division, in place of E. K. Morris, who accepted a position with the Long Island as Division Superintendent. The position of Traveling Car Agent will be abolished.

*Chicago, Burlington & Kansas City.*—H. H. Fleming has been appointed Car Accountant, with headquarters at St. Joseph, Mo., vice John Dumbell, resigned.

*Chicago Junction Railways & Union Stock Yards Co.*—The annual meeting in Jersey City this week resulted in the election of the following board of directors: Chauncey M. Depew, Frederick H. Winston, Albert H. Veeder, John Q. Adams, Edward J. Phelps, William J. Sewell, Frederick H. Prince, Edward J. Martyn, Martin L. Sykes and George Peabody Gardner. The two English directors were not renominated, their substitutes being Messrs. Sykes and Gardner. These officers were elected: J. Q. Adams, President; W. J. Sewell, Vice-President; W. F. Lane, Secretary, and Thomas Sturges, Treasurer.

*Chicago & Ohio River.*—A. B. Starbuck has been appointed Car Accountant, with headquarters at Mattoon, Ill., vice J. H. Heden.

*Columbia & Puget Sound.*—The following changes have been made in this road: N. Poston has been elected Secretary, with office at Portland, Or., vice W. T. Wallace; W. E. Nichols is Purchasing Agent; L. E. Smith, Assistant Superintendent, vice G. J. McCabe, and Daniel O'Leary, Master Mechanic, vice C. F. Hobart, all with offices at Seattle, Wash.

*Denver, Salt Lake & Pacific.*—The trustees of the company elected officers as follows, at a meeting at Denver, July 8: President, ex-Governor John Evans; Vice-President, Wm. N. Byers; Secretary, W. J. Evans; Treasurer, J. J. Reithmann.

*Galveston, Harrisburg & San Antonio.*—The Board of Directors of the company held the annual election of officers last week. The old officers were re-elected as follows: C. P. Huntington, President; J. Krutschmitt, Vice-President, and P. J. Huder, Treasurer. All of the officers reside in Houston, Tex., except Mr. Huntington, whose office is in New York.

*Great Northern.*—H. J. Green has been appointed General Agent, with headquarters at Tacoma, Wash. W. H. Long has been appointed Traveling Freight and Passenger Agent, with office at Cedar Rapids, Ia.

*Hot Springs.*—F. A. Bill has been elected Secretary, Auditor and Local Treasurer at Hot Springs, Ark., vice M. N. Pierce, resigned on account of ill health.

*Kansas City & Atlantic.*—The following is a corrected list of the names and addresses of the directors of this company, recently chartered in Missouri: Francis Amory, Stephen M. Crosby and E. W. Burdett, Boston; W. F. Burns, Baltimore; W. Stuart Walcott, New York; T. Attwater Barnes, New Haven, Conn.; John J. Hanson, Dover, N. H.; Arthur C. Paine, Portland, Me.; Stephen Salisbury and Theodore C. Bates, Worcester, Mass.; Walton H. Holmes and Thomas R. Morrow, Kansas City.

*Kentucky Midland.*—D. H. Sinclair has been appointed Auditor for the operators of this road, vice S. French Hoge, resigned.

*Kingfield & Dead River.*—At a stockholders' meeting at Portland, Me., the following directors were elected: Arthur Sewall, Bath; Payson Tucker, Portland; Weston Lewis, Gardiner, Me.; V. B. Mead, Boston, and F. D. Barnum, Lynnfield, Mass.

*Lake Chelan R. & Navigation Co.*—A. F. Nichols formerly General Superintendent, has been elected Vice-President of this company. C. J. Trow has been appointed Superintendent, with office at Chelan, Wash.

*Mexican National.*—H. C. Reese has been appointed Commercial Agent of this company, with headquarters at No. 45 St. Charles street, New Orleans, La., vice G. T. Badeau, resigned.

*Missouri, Kansas & Eastern.*—W. J. Finney, a son of the contractor who built this railroad, has been appointed Roadmaster of the line, with headquarters at St. Charles, Mo.

*Missouri, Kansas & Texas.*—A. T. Drew has been appointed Assistant General Freight Agent of the road with headquarters at St. Louis.

*New York & Northern.*—H. H. Vreeland, having resigned as General Manager, G. G. Haven, Jr., has been appointed Acting General Manager. Thomas Millen has been appointed Superintendent in addition to his duties as Master Mechanic. His office is at High Bridge, N. Y.

*New York, Texas & Mexican.*—At a meeting of the directors at Victoria, Tex., last week, Mr. W. S. Haskins was formally elected a Director and Vice-President of this company and also of the Gulf, Western Texas & Pacific. Mr. Haskins was formerly General Superin-

tendent of the Sabine & East Texas, another Texas line of the Southern Pacific, but has been acting as Vice-President of the above companies since May.

**Pittsburgh, Cincinnati, Chicago & St. Louis.**—The directors met at the office of the Pennsylvania Railroad in Philadelphia last week and re-elected the following officers: President, George B. Roberts; Treasurer, T. H. B. McKnight, of Pittsburgh, and Secretary, S. B. Leggett, of Pittsburgh.

**Port Townsend & Southern.**—A. A. Booth has been appointed Assistant Superintendent, vice F. A. Bailey, and Henry A. Kyer has been appointed General Freight and Passenger Agent, with office at Seattle, Wash., vice H. J. Green.

**St. Louis, Iron Mountain & Southern.**—Charles Potter has been appointed Roadmaster of the road, vice M. D. Hurley, resigned.

**San Antonio & Aransas Pass.**—Thomas B. Palfrey has been appointed Purchasing Agent, and R. H. Innes has been appointed Superintendent of Transportation, vice F. E. Nelson, resigned, with office at San Antonio, Tex. The office of Assistant General Manager has been abolished.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Alberta Railway & Coal Co.**—G. H. Strevel, contractor, expects to commence the work of widening this road at once to a standard gauge. The ties from the Crow's Nest are expected in a couple of weeks. The road extends from Dunmore on the Canadian Pacific west to Lethbridge in Alberta, 109 miles.

**Altoona & Philipsburg Connecting.**—There is now completed six miles of this road from Philipsburg and Coal Run Junction, Pa., the tracklaying having been begun on July 1. Twenty miles has been located and is under contract, from Philipsburg, Centre County, Pa., through Dunbar, Osceola Mills, Sterling, Houtzdale, West Moshannon, Ramey and Janesville to the line of the Pennsylvania & Northwestern Road at the Cambria and Clearfield County line. The grading will be completed by Aug. 1 on 12 miles to Ramey, Pa., and the track laid on most of it. W. T. Forsythe is Chief Engineer.

**Boston & Nova Scotia Coal Co.**—C. M. O'Dell is Chief Engineer of this company, which, as reported last week, is receiving tenders for the grading and masonry of the first 10 miles of the proposed railroad, beginning at the Broad Cove Coal Mines, Mabou, Nova Scotia.

**Calgary & Knee Hill.**—The proposed railroad between Calgary, in Alberta, and the Knee Hill coal mines northwest of Calgary has been located for 10 miles.

**Canadian Pacific.**—The contract for clearing on the branch line south of Revelstoke, B. C., is reported to be let and the actual work of construction has begun at the northern terminus. The branch is to be built to the head of Arrow Lake, about 30 miles, and will provide another outlet for the mines of the Kaslo and Slocan districts in the southern part of British Columbia.

**Chesapeake & Carolina.**—A line is being built from Burgaw to Onslow, N. C., by this company. President L. E. Watkins states that it is expected to complete it to Washington, N. C., in about four months. At Washington it will connect with the Washington & Jamesville.

**Chesapeake & Ohio.**—The tracklaying was started on July 1 on the Gauley Branch to connect with the Kanawha & Michigan, and will be completed on the 15th inst., the branch being nine miles long from Gauley, W. Va. The grading is about completed on the Loup Creek Branch, South Side Extension, from Rush Run, W. Va., and on the Keeneys Creek Branch, six miles from Nuttalls, W. Va., and the track will be laid within a few weeks. The Buckingham Branch in Virginia is now 21 miles long, from Arvonia south to the Rosney iron mines, 12 miles of this track having been laid in 1892.

**Cleveland, Wooster & Muskingum Valley.**—Work on the extension of the railroad from Wooster south to Millersburg, O., was begun on July 10. It is expected to have the entire 18 miles completed in three months.

**Dry Fork.**—Martin Lane, a director in the company, writes that most of the surveying has been done on the first 20 or 30 miles and through all the more difficult passes in the mountains. The right of way, so far as it was possible to get it by agreement, has been purchased; condemnation suits for the other parts of the route have been begun. Grading will be commenced within a few months it is stated. The road is to be built for the purpose of developing the timber along the route, the forests being in their virgin state and showing splendid hardwoods. The route is from Bretz, W. Va., on the West Virginia Central & Pittsburgh, along Dry Fork River, a branch of the Cheat River, through Tucker, Randolph, Pocahontas and Greenbrier counties to a point on the Chesapeake & Ohio Railroad. The principal stockholders at present are Levi Z. Condon, of Baltimore, Md.; Robert Whitmer, of Philadelphia, Pa., and Mr. Lane.

**Fitchburg.**—The work of double tracking the Watertown branch, which was begun late last fall, is now completed from West Cambridge to Watertown, and that part is in use, and the work will be hurried to completion at Waltham, Mass., 6½ miles from West Cambridge.

**Florida Central & Peninsular.**—During June the tracklaying on the Savannah extension was completed to St. Mary's River from Hart's Road, Fla., a distance of 10 miles. St. Mary's River is the boundary line between Florida and Georgia, hence this completes all the track to be laid in Florida. The tracklaying is now in progress at Savannah and from where the extension crosses the South Brunswick Terminal Railroad, both ways, north and south, toward Savannah and Jacksonville and as soon as the bridge across St. Mary's River is erected the tracklaying will be resumed from that point toward Savannah, making four tracklaying gangs. On July 1 there had been laid 16 miles of track built by W. S. Greene, of Jacksonville, is Chief Engineer of this extension.

**Georges Valley.**—This railroad, which James Mitchell, of Bucksport, Me., is building, is progressing finely. Three miles of grading are completed, the pile bridge across the Georges' River in Warren is erected, and a large force of men is working north toward

Union, Me., the northern terminus, eight miles from Warren Station.

**Great Northern.**—The grading on the Leech Lake extension of the Wadena & Park Rapids Division is completed as far as Akeley, 20 miles distant from Park Rapids, Minn. The grading has been done by Foley Brothers & Guthrie, of St. Paul, and most of the work was done in May and June with a force of from 700 to 1,000 men. No more grading will be done at present, and no arrangements are being made to lay the rails on this grade. It is not likely that the road will be completed and trains put on for some months. There are to be three stations on the road, one at Elbow Lake, one near Sand Lake and one at Akeley, the terminus. It is not known when the road will be built to Leech Lake.

**Gulf, Beaumont & Kansas City.**—President Kirby, of Houston, reports that the workmen now have 16 miles of the grading very nearly completed from Beaumont, Tex., north, and expect to finish a portion of the tracklaying before Aug. 1. There are about 50 carloads of rails delivered.

**Jacksonville, St. Augustine & Indian River.**—The tracklaying on the East Coast extension from the Indian River has been completed to Melbourne, Fla., four miles beyond Eau Gallie, which is as far as passenger trains are now running. When the construction work was resumed early this year on the East Coast extension, it was announced that the terminus of the line would be at Melbourne. Since then, however, it has been decided to continue the line along the coast to Lake Worth, Florida, nearly 125 miles beyond Melbourne, and the work is now going on, on the contract having been let for the entire line.

**Jacksonville Southeastern.**—The construction of the extension of this line through Fulton County, Ill., is now going on, the men working north of Canton, to which the road was completed in 1892. The objective point of the present line is Rock Island, Ill., about 100 miles from Canton, but there is no definite purpose of building to that point this year.

**Kaslo & Slocan.**—The company has commenced the construction of its railroad from Kaslo, B. C., to the mines of the Slocan mining district. The work now going on is on the first few miles from Kootenai Lake, west. The terminus of the line will be about 30 miles west of Kaslo.

**Kingfield & Dead River.**—A meeting of the stockholders at Portland, Me., was held last week and the organization completed. Arthur Sewall and Payson Tucker, of the Maine Central, were elected directors. Weston Lewis, Gardiner, Me.; Varnum B. Mead, Boston, and Frank J. D. Barnum, Lynnfield Centre, Mass., were elected as managing directors, with full power to make contracts and complete the construction of the road. This road is to be 10 miles in length and is to run from Kingfield to Jerusalem, Me. It is to be completed this fall, and will open up one of the largest and finest tracts of white birch and poplar in the state, besides a large amount of spruce, cedar and pine.

**Louisville & Nashville.**—The Log Mountain Branch, now being constructed up Clear Creek, in Bell County, Ky., was put under contract in the latter part of last January, to be completed on or before the 15th day of August. The prospect now is that the graduation, masonry, bridges, etc., will be finished prior to that time, but there will be no track laid before Aug. 1.

**Missouri, Kansas & Eastern.**—President Simmons, of St. Louis, and other officers, with Vice-President Purdy, of the Missouri, Kansas & Texas, are this week making an inspection of the entire line along the Missouri River from Bonville, Mo., to St. Charles, 163 miles. It is expected that the railroad will be transferred to the company by the contractors, the Southwestern Company, as soon as this trip is completed. The road will then be open for local traffic, but no through business will be done until the Bellefontaine bridge over the Missouri River, which is being built by the Burlington system, is completed. The through trains of this road will enter St. Louis over the line now being built by the Burlington, crossing the Missouri River at Bellefontaine.

**Montreal & Western.**—A trip was made over the completed road last week by Vice-President Shaughnessy and other officers of the Canadian Pacific and a number of citizens from various local towns. The road is now completed from St. Jerome to St. Jovite, Que., the newer portion of the line being north of St. Agathe, about 17 miles. The government engineers have not yet inspected this portion of the line, but that will probably be done in the course of a few weeks, and then it is expected that the section will be taken over by the Canadian Pacific and regular trains run over the entire road. The proposed northern terminus of the road is at La Clute aux Iroquois, 18 miles beyond St. Jovite.

**Myrtle Springs.**—B. F. Barrett, of Myrtle Springs, Tex., Secretary of the company, writes that the actual construction work on the road has not yet been begun, because the company has been delayed in securing the right of way. It is expected, however, to commence work in a few weeks. The road will be 10 miles long from Myrtle Springs to Wills Point, Tex., on the Texas & Pacific. E. A. Shaver, of Pittsfield, Mass., is President.

**Niagara Junction.**—About four miles of track has been laid on the road this year in the city of Niagara Falls, N. Y., principally on the property of the Cataract Construction Company, which controls the new road. The line will be completed as soon as the junction is made with the Lockport branch of the New York Central.

**Ottawa, Arnprior & Parry Sound.**—John Baskin, of Norwood, Ont., has received the contract for grading 26 miles of this road between Arnprior and Parry Sound, Ont. This work will take about six months to complete.

**Ottawa & Vandreuil.**—There seems to be a strong expectation that the work on this road will be commenced immediately, as only two weeks remain in order to prevent the bonus from the Ontario government of \$2,000 a mile being transferred to the proposed Central Counties road. It is reported that the portion between Rigaud and Pointe Fortune, Que., 97 miles, now operated by the Canadian Pacific, is to be abandoned and a new line built direct from Rigaud, on the Canadian Pacific. This line will probably pass but a short distance from Venleck Hill. From the latter place to Ottawa, the length of the road will be 45 miles.

**Paragould & Northeastern.**—The title of the Paragould & Buffalo Island has been changed to the above. It is now being changed to standard gauge from Para-

gould, Ark., to the St. Francis River, a distance of 10 miles. It is expected to build a drawbridge across the river in the fall and extend the line two miles farther.

**Philadelphia & Delaware County.**—Stock of this company to the amount of \$100,000 has been subscribed by the property owners along the proposed route, and the Pennsylvania has agreed to go ahead with the construction of the branch and complete it by next summer. The road, which will be about 10 miles long, will branch off from the West Chester Railroad near Angora, and follow up Darby Creek, thence across to Newton Square. It will pass through and open up a beautiful country, lying between the main line of the Pennsylvania Railroad and the Media & West Chester branch, and across Darby Creek, about three miles south of Bryn Mawr.

**Philadelphia & Reading.**—Ryan & Co., contractors, have resumed work on the Broad street and Lehigh avenue bridge, Philadelphia, which will carry those thoroughfares over the Reading Railroad at that point. The work, which includes a strong retaining wall along the south side of Lehigh avenue, from Park avenue to Broad street, and along the east side of Broad street to the bridge abutment, was begun over a year ago, and was suspended in February last. Owing to the financial troubles of the railroad company nothing further was done. The abutment along the northeast side of the railroad, which will be 290 ft. in length, is partly completed. The other abutment, on the opposite end of the bridge, will be 418 ft. long, and will extend to the north side of Lehigh avenue. Ryan & Co. have the contract for the entire work, including the heavy plate girder bridges, which are all ready to be shipped and placed in position by the Pencoyd Iron Works.

**Pittsburgh & Erie Line.**—This road is preparing to extend the Pittsburgh, McKeesport & Youghiogheny from Connellsville, Pa., south, through Uniontown, Pa., and on to the upper West Virginia coke fields. Since its completion to Connellsville, the Pittsburgh & Lake Erie road, which operates it, has been devising means for extending the line down to the coke works in the lower part of the Connellsville field. To extend the line south it will be necessary to bridge the river in two places and then follow the bed of Dunbar Creek parallel with the lines of the Pennsylvania and Baltimore & Ohio. The Pennsylvania occupies all the space between the river and the hills for half a mile below New Haven necessitating the crossing of the river at two points, at Connellsville and again at Gibson. Engineers are at work on a new route which leaves the main line at Dickerson's Run and follows the valley up past Elm Grove and Juniataville. By this route, the road can reach nearly all the works in the Connellsville field and by short branches can reach the others. This route will be rather expensive from Connellsville to Juniataville, but the route beyond Juniataville to Uniontown and to the Monongalia coal and coke fields will not be very heavy. The survey mentioned above is being continued to Uniontown by a second party of engineers.

The Youghiogheny road has about completed its five mile branch to Perryopolis, Pa. The contract for building it was let by the Pittsburgh & Lake Erie last February, and has been pushed rapidly. It is known as the Ellwood branch of the Pittsburgh, & Lake Erie. It starts at Whitsett Station, on the Pittsburgh, McKeesport & Youghiogheny and terminates at Cora, a new town which has been built about the Cora Coke Works. The Drake & Stratton Co. are the contractors.

**Quebec & Lake St. John.**—The materials for the construction of the iron bridge over the Chicoutimi River have arrived, and the work on the bridge will be shortly finished. The foundations of the station at Chicoutimi, Que., are being prepared. Nearly 1,000 men are now working on the extension, and the first engine to enter the town of Chicoutimi, Que., is daily expected. Regular communication is looked for by about July 15. Chicoutimi is on the Saguenay River, and the extension now building is over 50 miles long, from Lake St. John east to Chicoutimi.

**Raleigh & Western.**—The litigation with the Glenwood & Gulf road over a crossing of that line in Chatham County, N. C., has been recently decided favorably to this company. The first 10 miles of line west of Egypt, N. C., now building, involves heavy work and includes 20 trestles. Fully three-fourths of this work is completed. At the present time about two miles of track is laid, but this has been done solely for the purpose of delivering material to the bridge sites. In addition to the trestles above named, there will be one through steel bridge over Deep River with a span of 175 ft., resting at both ends on iron columns 40 ft. high, filled with concrete. The adopted maximum grade is one and one-half per cent., and maximum curvature eight degrees. Samuel A. Hensley is President.

**Raritan North Shore.**—A charter has been recently secured in New Jersey for this line, as recently noted, by officers of the Central of New Jersey. The charter is to cover the new lines which are being constructed from the Elizabethport & Perth Amboy branch from Perth Amboy, N. J., west to a point on the Raritan River for the purpose of reaching the various pottery and clay pipe works in that vicinity. The surveys were made last spring, and the work is now going on. The only object of getting a charter is to give the company authority to condemn the property necessary for right of way.

**Rice Lake, Dallas & Menomonie.**—The contract for the first section of the road, south of Rice Lake, Wis., has been let to a firm of St. Paul contractors. The distance is about 10 miles and takes the line to the crossing of the Minneapolis, St. Paul & Sault Ste. Marie road. The construction work is to begin this month, and it is expected that the work will be continued until the road reaches Dallas. The southern terminus is Menomonie, 45 miles from Rice Lake.

**St. Louis, Keokuk & Northwestern.**—The extension to St. Louis which is to give the Burlington system a new entrance into that city has been completed to the Missouri River and to the site of the new bridge being built at Bellefontaine Bluffs. The new road is being built under a separate charter but is practically an extension of this line, leaving it at a point between Old Monroe and St. Peters, extending south 30 miles to the Missouri River and thence over the new bridge to the city limits in St. Louis, ten miles additional. The piers of the Bellefontaine bridge are about completed and work on the superstructure will begin as soon as the high water in the river recedes.

**San Pete Valley.**—The contract was let last week for the ties on the Manti extension to contractors in the San Pete Valley and it is expected that most of

the ties will be delivered by Aug. 10. The grading is completed to Manti, Utah, on the Rio Grande Western, a point about 17 miles south of Moroni. The few trains that are now running do not seem to go below Moroni, although formerly they ran as far as Chester, about 10 miles beyond.

**Saranac Lake & Lake Placid.**—The first train over this road was run on July 11 from Saranac Lake west to Lake Placid, N. Y., where a connection is made with the Adirondack & St. Lawrence line. The road will be open for regular passenger traffic on July 15. It is only ten miles long but gives a direct railroad route between two important resorts in the Adirondack Mountains. C. E. Arnold, of Albany, is President. It is said that the road will be operated as an independent line.

**Sioux Falls, Yankton & Southwestern.**—Senator Pettigrew, of South Dakota, who is President of this railroad, is reported to have awarded a contract this week for the tracklaying and to have announced that this work will be commenced immediately. He hopes to have the road completed by Sept. 1. It is building from Sioux Falls southwest to Yankton on the Missouri River, and is about 60 miles long. There will be seven stations along the line and grain elevators with a storage capacity of from 15,000 to 25,000 bushels will be erected at each station. The land for terminals at Yankton has not yet been secured, but it is believed that the matter will be settled in a few days.

**Southern Pacific.**—Engineer Edward B. Cushing, of Houston, Tex., opened bids last week for an extension of the Louisiana Western from Lake Charles. The contract was awarded to J. H. Hughes, of Fort Worth. The extension proposed is about 12 miles in length, and traverses a fine section of country. It is designed to be a feeder for the Southern Pacific and to open up a section heretofore not penetrated by railroads. Work is to be commenced this month and finished in the fall.

**South Mountain.**—Work on this railroad, after a lapse of over 30 years, has apparently begun in earnest. Contractor James Clarke, of Philadelphia, has men at work near Reading, Pa., and in a month expects to have 400 men at work. The road will run from Harrisburg in a direct line to the Delaware River, with a branch from Reading. Years ago nearly half a million dollars were spent in grading and building bridge piers, which were then abandoned, but will now be used.

**South & North Carolina.**—This road is now operated as a branch of the Charleston Division of the Atlantic Coast line. It was formerly known as the Bishopville road, and extends from Atkins, S. C., northeast through Sumter County, 25 miles, to Lucknow.

**Texarkana & Fort Smith.**—Work on the extension of the railroad north of Wilton, Ark., is progressing rapidly, and the 12 miles beyond that place, it is thought, will be ready for the rails within the next 30 days, after which the road will be in operation north of Texarkana for a total distance of 46 miles.

**Toledo & Ohio Central.**—Five miles of track on the Ridgeway extension was laid last week. Tracklaying is proceeding at the rate of about one and a half miles a day. The road is under contract to Columbus, 50 miles altogether. The contractor is Gen. J. S. Casement.

**Wilkes-Barre & Eastern.**—Such rapid progress is being made on the construction of the line that the company purposes opening it for travel about Sept. 1. Plans for a new two-story pressed brick station building in Wilkes-Barre have been adopted. The structure will be erected on the west side, near the Market Street bridge. It will have a train shed 200 ft. long.

**Winona & Southwestern.**—The town of Hamilton, Franklin County, Iowa, has voted a five per cent. tax to aid in the construction of the proposed extension from Osage, Ia. The tax would amount to \$20,000, but as the town is on the Webster City route it may not be available. The extension when built will go via Mason City.

#### GENERAL RAILROAD NEWS.

**Chicago Union Junction Railways & Union Stock Yards Co.**—A resolution was adopted at the annual meeting this week giving the directors an annual compensation of \$2,500 each. Following is the Treasurer's statement for the past year: Receipts, balance from last year, \$210,638; dividends, U. S. Y. T. Co., \$1,024,577; interest, \$6,700; total, \$1,841,916. Payments, expenses, taxes, etc., \$98,247; proportion of extraordinary expenses, \$14,984; interest payments, \$796,850; dividends, \$910,000; balance carried to balance sheet, \$21,834.

**Cincinnati, Hamilton & Dayton.**—The company last week placed on record a mortgage on its property given to the Continental Trust Co., of New York, and the Union Trust Co. It is a general mortgage for \$3,800,000, securing five per cent. 50 year gold bonds. The money is borrowed for the purpose of funding the company's bonded and other debts with a long time, low interest bearing bond.

**Darien Short Line.**—The foreclosure sale under the decree obtained by the Continental Trust Company of New York took place at Savannah, Ga., on July 5, when the property was bid in for \$30,000 by a committee representing the bondholders. The road is about 20 miles long from Darien, Ga., a point on the Georgia coast north of St. Mary's, to a connection with the Savannah, Florida & Western at Walthourville.

**Denver & Rio Grande.**—The directors of the company have decided to pass the quarterly dividend of one per cent. upon the preferred stock, which ordinarily would have been declared last week. This action was taken because of the uncertainty regarding the company's future revenues, in view of the unsettled condition of the mining industry in Colorado. The company makes the following statement for the fiscal year ending June 30, the last month partly estimated:

	1893.	1892.	Inc. or dec.
Gross earn.	\$3,15,457	\$8,830,946	1. \$484,511
Oper. expen.	5,282,903	5,121,593	1. 161,310
Net earn.	\$4,062,554	\$3,709,353	1. \$323,201
All charges	2,608,550	2,795,241	1. 186,691
Surplus.	\$1,424,004	\$914,111	1. \$509,893

Out of the profits two dividends of one per cent. each, aggregating \$473,000, have been paid, leaving a surplus of \$951,004, as compared with \$914,000 last year, when no dividends were declared.

**East & West of Alabama.**—The foreclosure sale of this road, at Pell City, Ala., May 29, by order of the

United States Circuit Court, was confirmed July 7. The purchasers, Eugene Kelly and associates, of New York, will immediately take charge of the property.

**Illinois Central.**—The income from traffic for the 11 months ending May 31, 1893, is reported in the following table:

	1893.	1892.	Inc.
Miles oper.	2,888	2,888	
Gross earn.	\$18,142,755	\$17,685,935	\$456,850
Oper. expen. and taxes	13,130,299	12,868,623	261,676
Net earn.	\$5,012,456	\$4,817,312	\$195,174

The gross receipts from traffic for the month of June, 1893, are estimated at \$1,930,455; the receipts for June, 1892, were \$1,605,825, and the estimated increase over 1892 is \$324,630.

**Louisville & Nashville.**—The directors this week declared the regular semi-annual cash dividend of 2 per cent. from earnings of the half year ended on June 30. The dividends for the fiscal year amount to 4 per cent., against 4½ per cent. for the previous fiscal year and 5 per cent. for the year preceding that. The preliminary statement for the year just ended shows an increase in gross earnings of \$1,164,074, and a gain in net earnings of \$587,493. The ratio of operating expenses to gross earnings was 64.14 per cent. The fixed charges were \$128,071 in excess of those of the preceding year. The total net balance after dividends was \$626,513, compared with a deficit of \$25,867 in the previous year, and a surplus of \$656,226 in 1891. But from this year's balance was deducted the amount involved in the settlement of the Hardin County suit for interest and dividends on original stock subscriptions, which was begun in 1868 and was lost by the company in the Court of Appeals. The settlement involved \$225,737, leaving the final surplus at \$400,776. Subjoined is a comparison of the operations of the company for the last two years:

	1893.	1892.	Inc. or Dec.
Gross earn.	\$22,399,795	\$21,235,721	1. \$1,164,074
Oper. expen.	14,368,703	13,792,122	1. 576,581
Net earn.	\$8,931,092	\$7,443,59	1. \$587,493
Int. and tax.	5,502,134	5,371,063	1. 128,071
Profits.	\$2,528,958	\$2,069,536	1. \$459,422
Other inc.	411,000	533,293	1. 122,293
Total inc.	\$2,939,953	\$2,602,829	1. \$337,129
Loss on leases and Hardin C. suit.	427,172	252,696	1. 174,486
Surplus.	\$2,512,776	\$2,350,133	1. \$162,643

**New York Central & Hudson River.**—The gross earnings (partly estimated) of the company for the month of June were \$4,154,000, an increase over 1892 of \$513,000, and for the quarter ending June 30 the earnings were \$11,920,600, an increase of \$1,000,200 over the corresponding period last year. The earnings for the year ending June 30 were \$46,893,400, an increase over the previous year of \$1,414,700. These figures do not include the earnings of the roads leased during the current fiscal year.

**North Galveston, Houston & Kansas City.**—R. A. Reese, of Galveston, was appointed Receiver of this road last week by the Texas District Court. The suit for a Receiver was begun by J. H. Taylor, Superintendent of the road, the claims against the company amounting to \$27,000. The road is 18 miles long, extending from Virginia Point to North Galveston, Tex., and was only opened for traffic this year. The cost of construction was about \$160,000, and no bonds have yet been issued. The road was built by L. F. Menage and associates, of Minneapolis.

**Old Colony.**—The proposition of the Old Colony Railroad Company to consolidate with the Old Colony Steamboat Company on a basis of four shares of the former to three of the latter has failed, the Massachusetts Railroad Commission deciding that the basis was not a proper one, and declining to allow the consolidation on these terms. It is understood that the stockholders of the steamboat company and the officers of the railroad line have agreed upon another proposition, and will again petition the board for a hearing.

**Philadelphia & Reading.**—Judge Dallas, in the United States Circuit Court at Philadelphia, issued a decree on July 6 confirming the report of Master George L. Crawford and empowering the receivers of the Reading Railroad and the Coal & Iron company to issue certificates on behalf of the railroad to the amount of \$3,545,523, and on behalf of the Coal & Iron Company to the extent of \$197,526. The certificates will bear 6 per cent. interest, and in the absence of any proviso to the contrary they become practically a first lien on the property, having the same status as the floating indebtedness which they will replace. Judge Dallas also filed an opinion dismissing the petition of John Lornie, of Scotland, a bondholder, for leave to intervene as a party plaintiff in the Thomas C. Platt receivership suit against the Reading.

**Wilmington & Weldon.**—The semi-annual dividend usually declared in July has been passed and the directors issue a statement that although the road earned this dividend, which amounts to \$100,000, they are unable to declare a dividend because the company was compelled to pay out this year nearly \$100,000 in tax arrears to the State of North Carolina, in accordance with an act passed by the last legislature.

#### TRAFFIC.

##### Traffic Notes.

The Pennsylvania railroad carried out of Philadelphia during the first four days of July 115,111 passengers.

The Erie Railroad took into Chicago on July 12 an excursion of 277 people, all from points 300 or more miles distant from Chicago. This is the largest World's Fair excursion yet run into that city.

A million bushels of grain came into Kingston, Ont., last week from Western points. This is said to have been the largest receipts ever had at that port, and to have produced something like a blockade.

The Union Pacific has met the first class rate of \$25 from the Missouri River to Portland, Or., quoted by the Great Northern. Trans-continental rates continue in a demoralized condition, with no prospect of agreement.

There is some uneasiness among the Cincinnati lines over World's Fair rates, and it is reported that unless travel increases some of the lines will re-establish the \$6.50 basis from Cincinnati, with corresponding reductions from Indianapolis and other Ohio River points.

Charges are made that the Pennsylvania is cutting rates at Indianapolis, Cincinnati and Louisville. It is claimed that round-trip tickets are being sold between Indianapolis and Chicago for \$1 less than the regular rate, and the one-way tickets at a reduction of 50 cents.

The Texas anti-scalper law goes into effect Aug. 10. The new tickets, to be issued by the railroads in conformity to the provisions of this law, have printed on their face the following:

Notice. It is a penal offense for the purchaser or holder of this ticket to resell or transfer the same for a consideration, and the ticket or any unprinted part thereof is redeemable by the company at any ticket office of the company when presented for redemption within 10 days after the right to use the same has expired by limitation of time as stipulated herein.

The New York Car Service Association has made a rule imposing demurrage charges on cars of bulk freight for export after 10 days from their arrival. It appears that a good deal of freight had been consigned to New York for export and afterward ordered delivered to local consignees, this course being taken for the express purpose of avoiding demurrage charges. According to the announcement it is still the rule that where a car is ordered delivered to a local consignee it comes under the 48-hour free-time limit.

##### Chicago Traffic Matters.

CHICAGO, July 12, 1893.

The Western Passenger Association has authorized four World's Fair excursions from Association territory to Chicago, to be run July 17, 24 and 31 and Aug. 7, on the basis of one fare for the round trip from all points where the present agreed rate is \$15 or more. From points where the present rate is less than \$15 no reduction will be made. Tickets to be good on any train on selling date and to carry with them all car privileges except Pullman sleeping cars; good returning on either of the two succeeding Fridays following sale. For parties desiring to avail themselves of a longer limit, one-way tickets are offered at one-half the round rate trip, plus 50 cents. By the use of these tickets the return limit can be extended to Aug. 11. This move is in the nature of an experiment, and future rates will depend upon its success. The limiting of these tickets to certain days was done to prevent so far as possible manipulation by scalpers.

The Chicago & Grand Trunk has placed its tickets on sale in the Auditorium and Grand hotels, the latter the Raymond & Whitecomb excursion hotel at the Fair. This is in violation of the agreement of the Chicago lines to keep open but one city ticket office in addition to the depot office, but the Grand Trunk justifies its action on the ground that the agreement has already been violated by the Baltimore & Ohio in opening an office at Stony Island avenue, near the Fair, and also by the Pennsylvania in placing telephones and attendants in its exhibit at the Fair, and also in the Adams Express office in the Midway Plaisance, where sleeper reservations can be secured and all the accommodations of the city office extended, except the actual selling of tickets. The outcome of this action by the Grand Trunk will probably be that all the other lines will establish offices at the Fair, but such action is not likely to result in a demoralization of rates, as it is known that most of the lines have been in favor of additional offices for some time and only wanted an excuse for opening them. If any reductions in agreed rates are made the action will be inaugurated by the Trunk Lines.

The Western Passenger Association has granted permission to the Union Pacific to meet the rate made by the Northern Pacific and Great Northern of \$33.60 from north Pacific Coast points, applicable in both directions to and from Chicago via Omaha and the Northwestern line; also from St. Paul, but not to be made via lower Missouri River crossings.

Chairman Midgley announces that the reduced rates to Duluth should not be applied via St. Paul in connection with the Duluth & Iron Range route, for the reason that it will cut intermediate rates not affected by the reduced rate.

The Alton and Wabash have made an open rate of \$3.50 round trip from Jacksonville to Chicago, a cut of about \$4.50, on the ground that the Jacksonville Southeastern has been making rates below the agreed tariff. The latter line claims that it has proof of cuts by the Alton & Wabash which were submitted for investigation before any complaints were made by those lines.

It is reported that the Missouri River lines have accepted the ultimatum of the Union Pacific and will proceed on transcontinental business on a basis of 15 per cent. east of the Missouri River.

Complaints continue, apparently with cause, that this market is stocked with return portions of World's Fair tickets, principally over Wabash and New York, Ontario & Western, Nickel Plate and Lackawanna & Lehigh Valley. A meeting of managers and also general passenger agents of eastbound lines was held here to-day, and the other differential lines threaten to make open reductions eastbound unless the market is cleared. The Trunk Lines will be asked to take immediate steps to compel Eastern connections charged with having sent tickets here to take them off the market.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending July 8, amounted to 45,793 tons, against 47,409 tons during the preceding week, a decrease of 1,616 tons, and against 51,087 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	Wk to July 8		Wk to July 1.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.	5,464	11.9	5,602	11.8
Wabash.	2,923	6.4	2,817	5.9
Lake Shore & Michigan South.	9,325	20.4	8,921	18.8
Pitts., Ft. Wayne & Chicago.	6,329	13.8	6,026	12.7
Pitts., Cin., Chicago & St. Louis.	5,020	11.0	5,623	11.9
Baltimore & Ohio.	2,780	6.1	2,709	5.7
Chicago & Grand Trunk.	2,351	5.1	2,888	6.1
New York, Chic. & St. Louis.	4,586	10.0	4,451	9.4
Chicago & Erie.	5,072	11.1	6,046	12.8
C., C., C. & St. Louis.	1,943	4.2	2,326	4.9
Totals.	45,793	100.0	47,409	100.0

Of the above shipments 1,509 tons were flour, 15,225 tons grain and millstuff, 7,996 tons cured meats, 11,587 tons dressed beef, 2,209 tons butter, 879 tons hides and 4,771 tons lumber. The three Vanderbilt lines carried 42.3 per cent., the two Pennsylvania lines 24.8 per cent. The Lake lines carried 74,429 tons, against 67,008 tons during the preceding week, an increase of 7,418 tons.

(Other Chicago traffic news will be found on page 529.)